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THESIS

AUTOMATED FINANCIAL MANAGEMENT
INFORMATION SYSTEM FOR NAVY
FIELD ACTIVITY COMPTROLLERS

by

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March 1990

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Automated Financial Management Information System
for
Navy Field Activity Comptrollers

by

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ABSTRACT

The focus of this thesis is to review, and determine the development of, currently installed automated financial management information systems at Navy field activity comptroller departments that operate under the Navy's Resource Management System. Based upon the findings, develop a guide for use by comptroller departments in the development of an automated financial management information system. The resulting guide will be included in the Practical Comptrollership Course and Financial Management in the Armed Forces Course Textbook, offered by the Navy Postgraduate School in Monterey, California.

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I. INTRODUCTION

A. DISCUSSION

The Department of the Navy has assigned the responsibilities of managing appropriated funds down to the level of the Commanding Officer of a unit. Accountability for managing financial resources is established by federal law (Title 31 United States Code). Specifically, Title 31 of the U.S. Code on "Money and Finance" has two sections that directly influence the use of appropriated funds. Title 31 U.S. Code Section 1301 requires that appropriated funds be obligated for the intended purpose that Congress specifies. And, Title 31 U.S. Code Section 1517 prohibits any government employee from obligating in excess of the amount authorized. A violator of Title 31 Section 1301 or 1517, either willfully or unknowingly, is subject to disciplinary action or criminal penalties. [Ref. 1:p. A22, 2:p. 10]

Congress has sent out a clear message to all DoD activities with passage of Title 31 U.S. Code. That is, all activities must manage their financial resources accurately enough to ensure that all appropriated funds are obligated in a manner to prevent a violation of Title 31. To do this, an activity must be able to recognize it's financial position and be able to monitor it's progress while executing the activity financial plan. Without this capability, it is difficult for an activity to manage it's resources effectively and not incur a Title 31 violation. This highlights the importance of an effective Financial Management Information System (FMIS). A FMIS needs to be able to provide the needed information to

management, so that a manager can effectively allocate available funds and at the same time meet the requirements set forth by Congress.

B. OPERATING ENVIRONMENT

1. Source of Appropriated Funds

The Navy Comptroller (NAVCOMPT) is responsible for the financial management of appropriated funds allocated to the Department of the Navy (DoN). NAVCOMPT receives funds from the Secretary of the Navy, and distributes these funds to major claimants. A major claimant is a bureau/office/command/headquarters that is designated as an administering office. And is assigned specific budgeting, accounting, reporting, and budget execution responsibility. Subclaimants are commands designated to receive a subclaimant operating budget from a major claimant. [Ref. 1:p. B21]

Major/sub claimants redistribute funds to responsibility centers (i.e., shore commands) via allotments. An allotment is the authority, expressing a specific amount of funds, for an activity to commit, obligate, and expend funds for a specified purpose. An allotment is provided to the activity by NAVCOMPT Form 2168-1 Resource Authorization. In addition to the funds, the NAVCOMPT 2168-1 also specifies the legal limitations and restrictions placed on the funds.

The responsibility center is the lowest level in an organization that the legal responsibility under Title 31 can be assigned. The Commanding Officer of a responsibility center retains the full legal responsibility under Title 31. A responsibility center further divides the allotment into operating targets (OPTARS). OPTARs are administrative redistributions of funds to the departments or divisions, called "cost centers", within a responsibility center.

Cost centers operate within a set of policies and procedures, established by a responsibility center, to control the obligation of funds. While cost centers are not directly subject to Title 31, an inadequate system of administrative controls on the use of OPTAR funds can lead to an over obligation of funds at the activity level, thus exposing the responsibility center to a violation of Title 31.

2. Accounting System

A Financial Information Processing Center (FIPC) is an activity that is assigned the task of performing official accounting and disbursing for a responsibility center, including maintaining official accounting records, civilian payroll, and bill paying.

The FIPC is a disinterested third party that consolidates financial transactions, and provides official accounting reports to higher authority (i.e., major/sub claimant). Major/sub claimants depend primarily on these official accounting reports to evaluate budget execution performance of a responsibility center. Throughout the year, the major claimant reviews the responsibility center's obligation rates, unliquidated obligations, and unmatched expenditure rates to determine whether to recoup or grant additional funds.

A responsibility center that receives Operations and Maintenance Appropriation (O,M&N) allotments, operate under the Navy's Resource Management System (RMS). RMS is the formal Navy system that tracks and accounts for financial resources assigned to responsibility centers. A Responsibility center that operates under RMS is referred to as an RMS activity.

Responsibility centers and cost centers each maintain local accounting records called "memorandum accounts". The memorandum accounts are

maintained to monitor the use of funds, and are the source documents for the reconciliation against official FIPC records. They are not recognized as the official records because they are not directly visible to the major/sub claimant. [Ref. 2: p. 21]

3. Integrated Disbursing and Accounting System

The Navy Accounting and Finance Center (NAFC) in Washington, D.C. was designated as the project office for the Integrated Disbursing and Accounting system (IDA). NAFC, was to develop an automated system that would consolidate and standardize Navy accounting practices. In October 1989 DoN was notified that the Secretary of Defense was reviewing the issue of a standardized Department of Defense (DoD) integrated accounting system. In December 1989, as a result of this review, further development of all accounting systems, including IDA, have been cancelled. IDA will ultimately be replaced with a DoD accounting system.

IDA is the automated accounting system that is operated by the FIPC's. With the cancellation of the IDA project, the intended consolidation and standardization of the various automated systems at the different FIPC's will not be completed. Therefore, field activities will have to operate the currently in-place, not fully developed, IDA system until the new DoD system comes on line.

4. Official Accounting System vs. Unofficial Accounting Systems

There are two reasons for maintaining unofficial accounting records at the activity level. First, the IDA accounting system is never up-to-date [Ref. 6:pp. 5-6]. There is a lag between the time an obligation is created and when the IDA system posts the transaction. This delay is due to IDA being a batch oriented processing system. (Ultimately the final version of IDA was to resolve

this problem by going to an on-line system.) Therefore, the current IDA system does not provide real-time account balances.

Second, the IDA accounting system is inaccurate. These inaccuracies can be attributed to human input errors at either the FIPC or at the local command. Presently the only way to identify and reconcile these errors is with a second accounting system. [Ref. 2:pp. 27-30]

The second unofficial accounting system exists at the cost center level. The cost centers have the same motivations as the Comptroller to maintain their own accounting records. These accounting records are unofficial but vital. The cost centers are routinely tasked by the Comptroller to reconcile transaction listings and research discrepancies. Cost centers also have the need to know their current OPTAR balance on a daily basis.

All three accounting systems are necessary to be able to keep track and maintain accurate financial accounts. The major claimant recognizes the IDA records and account balances, which in-turn requires the shore command to ensure that IDA is accurate. There will always be two unofficial accounting systems within the commands to support and validate the official system, and to meet their internal financial management information needs.

C. PURPOSE OF RESEARCH

The primary purposes are: to determine what attributes should be incorporated in a Navy shore activity's Automated Financial Management Information System (AFMIS); review currently installed AFMIS's at Navy shore activities; and develop an information guide on AFMIS's for Comptrollers. The guide is to be used in the Practical Comptrollership course and Financial Management in the Armed Forces course at the Navy Post Graduate School.

D. SCOPE OF RESEARCH

The thesis will provide information as to what should be expected from a Navy shore command's AFMIS in addition to addressing the following research questions:

- Do instructions/directives exist for providing guidance to Navy shore activity Comptroller's, in the development of a local AFMIS?
- Is there a need for further/improved guidance to be provided by the Navy Comptroller in regard to Navy shore activity Comptroller's AFMIS?
- What AFMIS's are currently in place at Navy shore activities, and, what are their features?
- How were the AFMIS's developed?
- Are there RMS activities AFMIS's similarities, and if so, how did these similarities come to be?
- What features should be incorporated into a Navy shore activity AFMIS?
- Should Navy shore activity AFMIS's be compatible with other activities?

Navy Comptrollers are tasked with a significant number of administrative requirements, of which many could be automated. It is not the intent of this thesis to address all areas in a comptroller department that lend themselves to automation.

E. RESEARCH APPROACH

The research for this thesis was conducted in two phases. The first phase was to determine what financial information should be reviewed by RMS activities management. This phase of the research entailed a thorough review of pertinent publications, and establishing a liaison with several key individuals in the Navy Comptroller Organization. Initially, the task was to determine what the typical Comptroller at a Navy shore activity should have in his/her AFMIS. Information was obtained via interviews from the following commands:

- Commander, Navy Accounting and Finance Center, Washington, D.C. (NAFC)
- Commander, Naval Surface Force, U. S. Pacific Fleet (COMNAVSURFPAC)
- Commander, Fleet Accounting and Disbursing Center, Atlantic (FADCLANT)
- Commander, Fleet Accounting and Disbursing Center, Pacific (FADCPAC)
- Naval Electronics Command, San Diego

Once it was determined as to what the AFMIS should consist of, it was necessary to obtain a sound understanding of the IDA system. Two intended features of IDA were to provide an AFMIS through a fourth generation language report generator. And, IDA was to evolve into an on-line processing system, in place of the current batch oriented processing system [Ref. 3:p. 15]. Information on IDA was obtained from the Requirements and Specification documents for the IDA system and via interviews with key NAFC personnel that were involved with the development of IDA.

The second phase entailed visiting selected RMS activities to address the research questions. Five RMS activities were reviewed.

The field research consisted of independent interviews with the Comptroller, Budgeting Supervisor, and the Accounting Supervisor at each activity. The intentions of the interviews where four fold:

- Determine what automated FMIS is currently in place.
- Determine the hardware and software configuration currently in place.
- Determine their methodology as to how they developed their current system.
- Determine what guidance was available to assist shore RMS activities in the development effort of an AFMIS.

The interview process was a semi-structured process. The interviews entailed using a predesigned interview form to ensure that all research questions were addressed in a manner that they could be compared between the different RMS activities [Ref. 4:p. 111].

F. THESIS FORMAT

The structure of this thesis consists of two primary sections. Chapters 1 through 4 and Appendix A address the research methodology, what attributes an AFMIS should have, findings, conclusions, and the recommended financial management information system charts/reports, respectively. Appendix B is a supplemental section to the Practical Comptrollership Course and Financial Management of the Armed Forces Student Textbook. It provides both background and guidance for comptrollers that are considering the automation of their FMIS's.

II. MANAGEMENT INFORMATION

A. INFORMATION NEEDS

Without having the right information at the right time, a manager is unable to carry out his/her responsibilities effectively. Information must be "the" information that a manager needs for the particular decision making process that he/she is encountering. And, the information must be timely. Timeliness is crucial, receiving the information when there is not adequate time for the manager to take advantage of a situation, or to correct a problem is unacceptable.

In any given situation, managers have different ideas as to what information is needed, and when. The variances stem from some managers having a better feel for a particular situation, or maybe having a better understanding as to what information is most relevant. The level of experience of the manager will also impact the managers information requirements. Depending on the level of diversity in the organization and the dynamics of the business routine, information requirements could range from a very stable (a very systematic and well established routine), to a very dynamic organization that has continually changing information requirements.

Management has seven types of information requirements: [Ref. 5:pp. 32-34]

1) Comfort information: information that will tell a Comptroller if the organization's performance is acceptably close to planned performance.

2) Status information: information that helps managers to monitor projects or resolution of problems. For example, tracking the obligation rate in preparation for the Mid-Year Review.

3) Warning information: information that tells management that a problem might be encountered. For example, information that shows higher then usual overtime usage, or exceeding the projected obligation rate.

4) Planning information: information that helps an organization to determine what the objectives should be and how to achieve them. For example, in the budgeting process, the information that is gathered over the previous fiscal year, current fiscal year, and proposed budget requests from the various cost centers would be planning information.

5) Internal Operations information: indicators of internal organization performance compared to expectations

6) External Intelligence information: information provided from other sources outside an organization. This could be as formal as a Navcompt 2168-1 Resource Authorization document, or unofficial as a call on the telephone giving a command advance notification that there is a change in a mission area that will impact its financial projections.

7) Externally Distributed information: information that is being provided to interested parties outside an organization. For example, the Type Commander (TYCOM) reviews an activity's financial status based upon the information provided by the FIPC.

These seven types of information might be similar in some situations, but different in others. Information is generated to meet several different management needs. For the most part these information requirements are predictable, but must be flexible to meet the current situation.

B. COMPTROLLER MANAGEMENT INFORMATION REQUIREMENTS

When trying to identify the management information that is required to support a shore RMS activity, three questions need to be answered: 1) What information should be reported to the users (i.e., Commanding Officer, Executive Officer, Department Heads, and Comptroller) so that they can effectively execute the responsibilities of their office? 2) How should the information be presented? The method of presentation can directly affect how management will interpret the information, and the amount of effort required in reviewing the

information. 3) How often should the information be presented? Should management review every report on a weekly basis? Or, should they review only selected reports on a periodic basis. Should exception reporting be used? The latter two questions are addressed first, followed by the minimum management information that is required in an AFMIS.

1. How the Information Should be Presented

Navy RMS activity financial managers are faced with the challenge of keeping abreast of all financial accounts, appropriations, and special interest items. They must be able to review these various areas in the most efficient manner possible. The trend in the commercial sector has been towards the use of graphical presentations in reviewing management information. In 1986, 67 percent of all reviewed MIS's used computer graphics. Graphics, if presented properly, have the ability to depict trends more clearly to management compared with the same information that is displayed in a column format in a report. [Ref. 7:p. 61]

2. How Often the Information Should be Presented

Management does not have the need, or is capable of, reviewing every report that is generated every day. There are certain areas of the operation that requires management's attention on a daily basis, but there are other areas that require only occasional review. An automated management information system should help management in deciding what reports should be reviewed at any given time [Ref. 8:p. 19]. Managerial reports fall into three report generation frequency categories: 1) routinely scheduled reports; 2) reports by exception; 3) reports provided upon request. Each are discussed below.

a. Routinely scheduled reports

If the reports are for satisfying comfort information requirements, then the reports should be generated on a routine, periodic basis. An example of this type of report would be the Status of Funds report that would be presented to the Commanding Officer on a weekly basis.

b. Reports By Exception

If the report is for providing warning information, then the report might be more appropriate on an exception basis. An example of this would be the monitoring of the use of overtime. If the planned overtime budget is exceeded by a certain percent, the report is automatically generated for the Comptrollers review. This form of exception reporting also works well with monitoring cost center optar balances and accounts that have special restrictions.

c. Reports Generated Upon Request

Reports in this category would be trend analysis reports. These reports could be tailored to meet the planning information requirements for budget preparations, or "what-if" scenario's.

3. Automated Management Information System Reports

The Comptroller's AFMIS needs to meet the following information requirements:

- Replicate the financial summary data that the major claimant is reviewing. A Comptroller can not accurately respond to inquiries made by the major claimant involving the financial status of the command without being aware of what the major/sub claimant is reviewing. [Ref. 8:p. 19]
- Generate summary charts for presentation to the Commanding Officer, Executive Officer, and department heads. These graphs should provide comfort and/or warning information. These charts/graphs should depict trends over a period of time as well as compare actual performance against the planned budget.

- Generate summary information graphs of high interest or sensitive areas. This would encompass financial accounts with ceilings (a maximum imposed amount to be spent in a given area) or floors (accounts that are required to have a minimum amount of funds expended in them). This would also include congressionally sensitive items such as interest payments and outstanding travel advances.

- Generate summary charts for monitoring the internal operation of the Comptroller department. Management reports are needed to evaluate the performance and effectiveness of the employees/department as well as identifying weaknesses.

The frequency and distribution of these various types of management graphs/reports would vary for each command. The following management information reports are considered to be the minimum reports for a shore activities AFMIS [Ref. 1:p. D98, 6:pp. 9-10, 8:pp. 19-20].

a. Undelivered Orders Reports

Undelivered Orders (UDO's) represent capital tied up into goods or services not yet received [Ref. 1:p. B24]. There are a several reasons to monitor UDO's. First, in the event of a funding shortfall, UDO's could possibly be cancelled and the funds recouped. Second, an order may have been cancelled and the resulting funding credit not reflected in the IDA system, therefore a possible source of funds. Finally, major/sub claimants monitor subordinate commands UDO's.

UDO's should be monitored by both dollar value (Appendix A Figure 1) and by quantity (Appendix A Figure 2). A few high value UDO's could inappropriately skew the charts.

b. Unmatched Expenditures Reports

Unmatched expenditures are discrepancies between the information in IDA, on an obligation document, and the billing documents information. These discrepancies arise due to data entry errors or prices

changes/variances between the obligation document and the actual price charged on the billing document.

Unmatched expenditures require the attention of a Comptroller for two reasons. First, with each unmatched expenditure there exists the possibility that the obligated amount in the IDA accounting system is understated (the goods or services cost more then the posted amount), this could contribute to an over obligated status (violation of Title 31 section 1517). The reverse also holds true, in that, if there is a substantial amount of overstated obligations, then there are funds available in the system that a Comptroller is unaware of.

Second, an effort on the part of the accounting staff is dedicated to resolving unmatched expenditures. Monitoring unmatched expenditures gives management a tool to review how well the staff is performing in respect to resolving unmatched expenditures.

Unmatched expenditures should be tracked by both dollar value (Appendix A Figure 3) and quantity (Appendix A Figure 4).

c. ***Obligation and Commitment Reports***

A commitment is an administrative process of reserving funds for a future obligation. An obligation is an order placed or a contract awarded. An obligation is an official reservation of funds. Both commitments and obligations directly affect the future balance of funds. It is necessary to monitor both obligation and commitment level to ensure that a Title 31 violation is not incurred. The following five reports assists the Navy shore command's management in monitoring commitments and obligations at various levels of the organization. [Ref. 1:p. B15]

(1) Commitments Planned vs. Actual Report. Monitoring available funds (Total Obligated Authority less Gross Adjusted Obligations equals Available Balance) requires that both commitments and obligations be reviewed together. This will give management the information needed to evaluate the current funding environment within the command (Appendix A Figure 5).

(2) Obligations Planned vs. Actual Report. Obligations are the official reservation of funds based upon placing an order or awarding a contract. This report is reviewed by the major claimant, via IDA, to evaluate an activity's obligation rate compared to its budgeted rate (Appendix A Figure 6).

(3) Base Operating Expense Report. Next to Civilian payroll expenses, base operating costs are traditionally the next highest expense category. The Base Operating Expense Report should be a summary report of all base operating expense accounts (Appendix A Figure 7).

(4) Cost Center Operating Target Report. Commanding Officers allocate funds to cost centers for the purpose of conducting their daily business. The Cost Center OPTAR Report serves as a routine management tool for the cost centers, and as an exception report to the Comptroller if the cost center exceeds the parameters imposed within the report (Appendix A Figure 8).

(5) Reimbursable Execution Report. The majority of shore activities require the assistance of other commands/organizations to perform services. This is often done on a reimbursable means. The requesting command submits a work/service request to the providing organization. Within this work request there is an agreed dollar amount that it will cost for the service. The amount of the work request is obligated upon submission to the servicing activity. Failure to monitor reimbursable accounts could lead to either an

account with excess funds, or an over obligated account at the end of the fiscal year.

The Reimbursable Execution Report (Appendix A Figure 9) monitors the actual reimbursable execution, compared to the planned. This report would be generated on an exception basis (the actual cost of the reimbursable work falls outside the parameters of the budgeted costs).

d. Civilian Pay Reports

The following four civilian personnel reports are recommended: Management to Payroll Planned vs. Actual, cumulative; Management to Payroll Planned vs. Actual, by pay period; Overtime Dollars Planned vs. Actual; and Civil Service Grade Creep. [Ref. 8:p. 20]

(1) Management to Payroll Reports.

If a civilian pay account becomes over obligated, corrective action can involve several different initiatives, depending upon the severity of the over obligation and how early the problem was identified. The solutions range from hiring freezes, laying off temporary employees, elimination of overtime, and possibly furlough.

The civilian payroll accounts should be monitored, at a minimum, on an exception basis. The accounts should be monitored on both a cumulative (Appendix A Figure 10) and pay period basis (Appendix A Figure 11).

(2) Civilian Overtime Dollars Report. If civilian overtime dollars are budgeted out to the cost centers, then this report would be appropriate for review at the cost center level on a periodic basis (Appendix A Figure 12). If the overtime dollars are centrally managed, then the reports should be generated for the shore command's management to review.

(3) Civilian Personnel Grade Creep Report. By monitoring the overall average civil service grades within the organization, it is possible to evaluate the hiring practices of the organization. The average civil service grade directly affects the overall cost within the civilian pay account. This report would be appropriate for review on a periodic basis (Appendix A Figure 13).

e. Higher Authority Interest Item Reports

Due to Congressional interest in the Navy's budgeting process, there are financial accounts that receive closer then normal scrutiny from the major/sub claimant. These high interest areas warrant incorporation into the AFMIS. Interest payments, as a result of not meeting the Prompt Payment Act provisions, (Appendix A Figure 14) and Outstanding Travel Advances (Appendix A Figure 15) are examples of currently highly visible accounts. [Ref. 1:p. D98]

C. COMPATIBILITY OF FINANCIAL MANAGEMENT INFORMATION SYSTEMS

Compatibility is a critical aspect of any automated information system. When an information system involves more then one computer system, the question of compatibility arises. Compatibility of computer systems have two areas of focus; compatibility of hardware (computers) and compatibility of software.

Micro-computers are in use at both the cost center level and the comptroller department level. If an AFMIS system is going to encompass these two activity levels, then the hardware configuration must be compatible. A comptroller's AFMIS should have the capability of receiving financial data from the cost centers (electronically) and the cost centers should be able to receive data from a comptroller's AFMIS. Without hardware compatibility, the electronic transfer of data would not be possible.

RMS activity AFMIS's should be compatible with the Navy 's official accounting system (IDA). An RMS activity AFMIS should have the capability to electronically receive (download information) and transmit (upload information) data between the two systems. Without compatibility, the information will have to be manually transferred from one system to the other.

As with hardware, software within a AFMIS must also be compatible. If information that is entered in one part of the AFMIS is intended to be used in another part of the AFMIS, then the different software components that share this data must be compatible (data must be stored and retrieved in a format that is recognizable by the two systems). Without direct compatibility, an additional program might be required to modify the format of the data from one program to the other program so that the data can be used. Or worst case, the data will not be transferable due to the lack of compatibility.

III. RMS ACTIVITY FINANCIAL MANAGEMENT INFORMATION SYSTEM'S

A. OVERVIEW OF FINDINGS

While conducting interviews at the RMS activities, the following observations were made: There is very little consistency between the comptroller departments AFMIS's; There is no guidance available to the RMS activities as to how to approach the development of a AFMIS; Of the five RMS activities that were reviewed, there is not a single application program that was utilized in more then one activity; The methodology as to how comptrollers generate their management reports are all different; and, the use of micro-computers varied considerably from each command.

B. GUIDANCE ON THE DEVELOPMENT OF AUTOMATED FINANCIAL MANAGEMENT INFORMATION SYSTEM'S

Based upon a literature search and the interviews conducted, it is the opinion of this author that there has been no guidance provided to RMS activity comptrollers for the purpose of automating a local FMIS.

C. CURRENT IN-PLACE FINANCIAL MANAGEMENT INFORMATION SYSTEM'S AT RMS ACTIVITIES

1. Features of In-place Automated Financial Management Information System's (AFMIS)

The features of the various AFMIS's vary greatly. There is very little commonality amongst the Navy shore activities. The features of the different systems include:

- Electronic transfer of either accounting data or report information from IDA to the RMS activities AFMIS. Of the five RMS activities, one activity is downloading information (electronic transfer of data from IDA to the activities AFMIS). The other four RMS activities use IDA printouts to extract the relevant data for review.

- Automated report generation. Automated report generation varies at the five commands. Four of the five commands use micro-computers to manipulate and display data. The one activity that does not use the micro-computer relies upon manual ledgers and the IDA printed reports.

- Ability to generate reports by exception. None of the RMS activities use a report by exception reporting methodology. All reports are generated upon request.

- Use of graphs and charts to display management reports. Two of the five RMS activities use graphical printouts to present their information. The other three activities present their information in spreadsheet format.

- Data sharing among micro-computer users. Of the five systems reviewed, one RMS activity has the capability to share information with other users. All other systems are application and user independent.

- Exportation of AFMIS to cost centers for use. One activity has exported their AFMIS out to their cost centers for use.

- Ability to upload data to IDA from the local AFMIS. None of the RMS activities have this capability. Presently two of the activities are pursuing this capability (independent of each other).

2. What Are The Similarities Of The Various Automated FMIS's

Presently there is no standardization among any of the reviewed activities for gathering, manipulating, and reviewing automated financial management information. This has resulted in very few similarities. In the absence of guidance, all reviewed activities are determining and creating their own versions of an automated FMIS. The degree of automation in the FMIS's at the comptroller department level ranged from very little, to activities that use micro-computers on a routine basis for the purpose of information gathering and report generation.

All of the activities reviewed use the same basic financial information on a routine basis. But, there is no common method used for extracting the data and preparing it for presentation to management.

The software used on the micro-computers in the Comptroller Departments are also different. Both In-house developed software, where the command's computer programmers write a special designed program for that command (at one RMS activity), to the use of various Off-the-shelf software packages, such as Lotus 1-2-3 and dBase III, were used. For those activities that used the "off-the-shelf" software, the accountants and budgeteers in the comptroller department developed their own applications (working versions of the program).

3. How The Automated FMIS's Were Developed

While conducting the interviews, at the RMS activities, the following observation was: Comptroller Department personnel have very little, if any, understanding as to how to go about developing an automated FMIS. The automated systems that are currently in-place are piece-meal. The development is piece-meal in that an employee sees a need and pursues the automation of that particular report for a given financial area. More often then not, other potential requirements that could also be met by these efforts are not taken into account.

This approach to automating a FMIS results in several applications that possibly are redundant in nature, or, are not compatible with each other. Also, with this independent development effort, a problem arises as to who maintains the programs that were developed, and how will they be maintained. Modifications/changes to a program that are independently developed by a user

are very difficult and costly. Individuals that develop a program for their own use in an office environment traditionally do not document how the program operates. The user develops the program while they are working at their desk, and once the program meets their needs, they start using it without thinking of documenting what they have done. This was the case at the five RMS activities reviewed.

4. Problems Encountered in the Development of AFMIS's

During the development of the AFMIS's at the activities reviewed, several problems were encountered. The following "lessons learned" were vocalized during the interview process:

- The developers failed to identify what computer systems were available to the users. The developed application ended up not being compatible in all cost centers, which required the cost centers to procure additional equipment.
- Users where not involved in the development process. This lack of involvement resulted in flawed requirement specifications.
- The developed application required the cost centers to have a copy of a particular software package to use the AFMIS. Several cost centers did not have the required software package, and, did not have the funding to procure the required package.
- The developers of the application **assumed** that the users were familiar with computers and the selected "Off-the-Shelf" software. This lead to the development of an application that was too complex for the average user to use.
- Failure to field test the system prior to full implementation resulted in an unreliable product that users refused to use.
- Lack of scheduling formal training resulted in the implementation of the AFMIS with little support from the users. It was assumed that the users would be interested enough in the new AFMIS to obtain the training required for the new system, on their own.
- Desk top guides were not developed for the users. This greatly hindered the implementation process and user acceptance.

- Backup and recovery procedures where not adequately tested prior to implementation. This resulted in a cost center having to re-enter a significant amount of data into the AFMIS.
- Use of the developed AFMIS at the cost centers was not mandatory. Therefore, the cost centers refused to convert over from their old/familiar, system to the new system.
- There was no documentation for the AFMIS. When the developer transferred, there was no one knowledgeable within the organization to maintain the software.

5. Compatibility of AFMIS's

Compatibility of in-place AFMIS' were reviewed from three prospectives. First, from the view point of compatibility within the Comptroller department. Second, the compatibility between different RMS activities. And third, the compatibility between the RMS activities AFMIS and IDA.

a. Compatibility within the Comptroller Department

The computer hardware within the reviewed activities where found to be compatible. And, the software in use (primarily Lotus 1-2-3 and Dbase III) by the RMS activities were also found to be compatible, in that the programs are able to retrieve and store data in a format that can be recognized between the programs.

However, the compatibility of the applications (application being the adaptation of the commercial software to meet their needs) that are in use, are developed with little, if no consideration of other potential, or currently existing, applications. As a result, the applications are not compatible with each other. The applications are not able to share or transfer data electronically to other applications.

b. Compatibility Between RMS Activity AFMIS's

There is no apparent need for compatibility between RMS activity AFMIS's. RMS activities do not share any financial data between them. Therefore the need for compatibility does not exist.

c. Compatibility Between RMS Activity AFMIS's and FIPC

The determination of compatibility between RMS activity AFMIS's and FIPC is beyond the scope of this thesis. There is a need for the compatibility between FIPC and the RMS activities. Presently, there exists the capability for FIPC's to download data to RMS activities. Presently none of the reviewed RMS activities have the capability to upload to the FIPC system. Two of the five RMS activities are in the process of trying to gain this capability.

IV. CONCLUSIONS

A. INTRODUCTION

The conclusions offered in this chapter are based upon the readings, interviews, and observations made during the research conducted in the course of this thesis.

B. CONCLUSIONS

For RMS activities to be able to effectively manage their financial resources, it is necessary for the activity to have a local financial management information system (manual or automated) to supplement IDA reporting capability. Without exception, the reviewed activities recognize the importance of a local financial management information system and have one in place.

The IDA accounting system is not setup to provide the required up-to-date information in the format that the RMS activity managers require. The consensus among the RMS activities is that IDA's current report generation capability is inflexible and difficult to interpret.

Throughout the discussions with comptroller department personnel it is recognized that micro-computers can help them in their daily routine but are at a loss as to how to go about it. RMS activities need to take greater advantage of their available micro-computers. Micro-computers can enhance the productivity of the comptroller's department greatly. Computers take about 20 percent of the manpower time that manual calculations do [Ref. 9:p. 65].

With the RMS activity Comptrollers recognizing the need for automated financial information systems, the Comptrollers have been encouraging their

accountants and budgeteers to automate applications within their functional areas. The problem with this approach is that the staff does not have an adequate understanding as to how to approach the development of an AFMIS. The applications that are developed are stand alone applications with very little consideration of other possible applications.

C. RECOMMENDATIONS

RMS activities have two basic, but common, features. First, the information requirements at RMS activities are similar. Second, with micro-computers being readily available at the RMS activities, the focus of an AFMIS should be towards taking advantage of theses computers. The two recommendations made, take into account that IDA will adventually be replaced by a DoD standard accounting system.

These recommendations can be accomplished through the Navy Postgraduate School (NPS) Thesis process. If the NPS is used to accomplish these recommendations, it should be sponsored by the appropriate organization level that is able to promote and distribute the final product.

1. Development of a Generic Automated Financial Management Information System

To minimize the current duplication of effort in developing AFMIS's at the local activity level, a generic AFMIS should be developed. With the majority of the information requirements being the same at all shore activities, a generic AFMIS could be developed to support these common needs. The following features should be considered during the development of the generic AFMIS.

- The use of "Off-the Shelf" software in this development effort could greatly reduce the development time and effort.

- The generic AFMIS should be developed with modularity in mind. The shore activity should not be required to implement the complete AFMIS to take advantage of particular features of the AFMIS that the activity is interested in.

- The generic AFMIS should include a report generation capability so that the individual activities can customize their reports to meet their needs.

- The generic AFMIS should include a recommended training plan for activities to follow. Recommend the incorporation of an on-line tutorial (a computer program for training new users) as part of the training package.

- The generic AFMIS needs to be accompanied with a users guide for each type of intended user. Documentation on the application is necessary so that modification of the system at the local level would be possible.

2. Establish Guidance for RMS Activities to Develop an AFMIS

Presently there is no published guidance as to how to automate a financial information system at RMS activities. Without having a guide to help direct the efforts of the shore activity, the difficulties encountered by various activities, as indicated in the findings, will reoccur at other activities.

Without guidance, systems will continue to be developed that are not standardized with other Navy activities. Even though the activities do not share financial data between them, reassignment of employees, via transfers, are common. With non-standardized AFMIS's, the need for the activity to retrain the newly arrived employee from another Navy activity, is an expense that could be prevented.

APPENDIX A - SAMPLE MANAGEMENT INFORMATION REPORTS

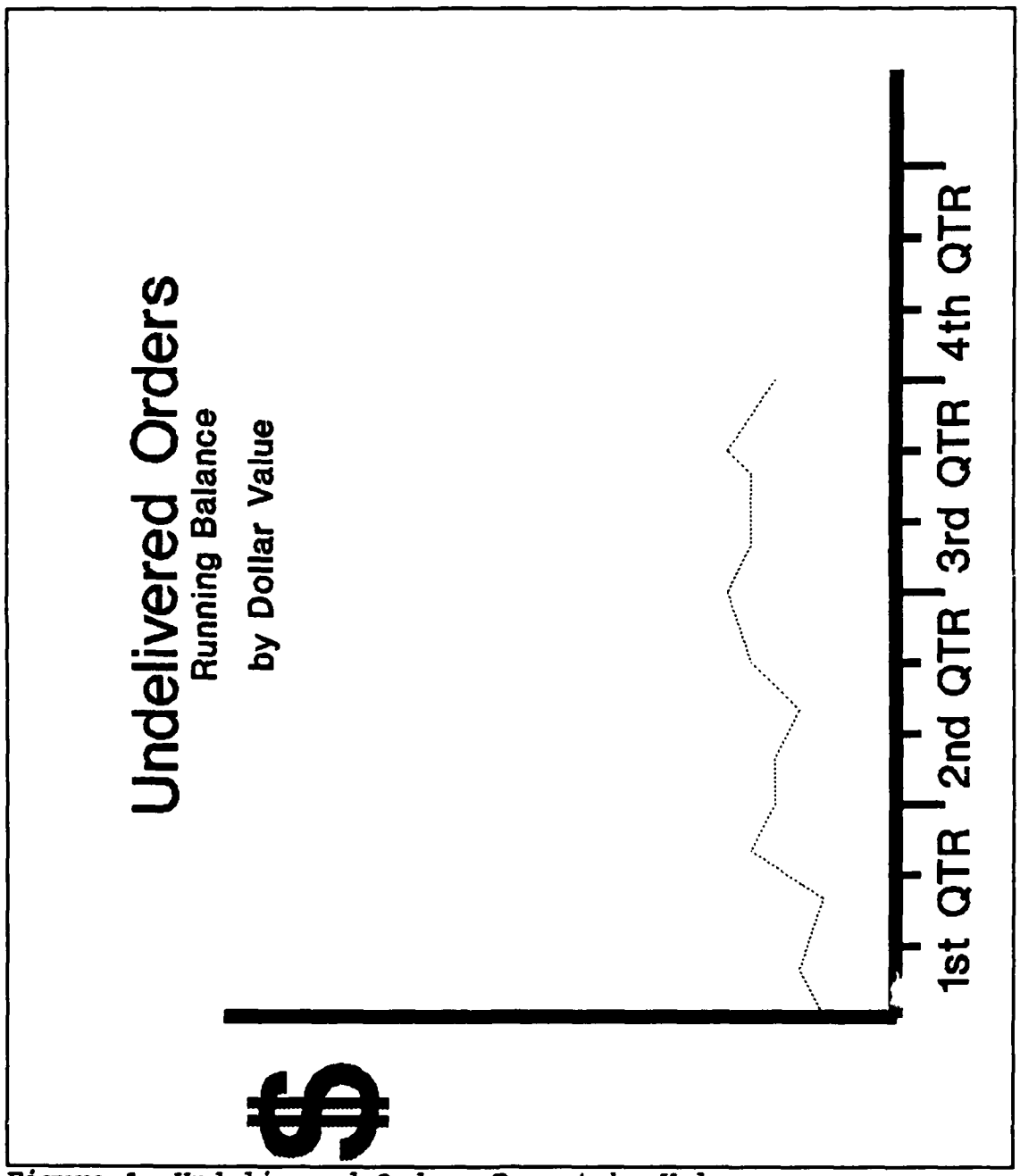

Figure 1 Undelivered Orders Report by Value

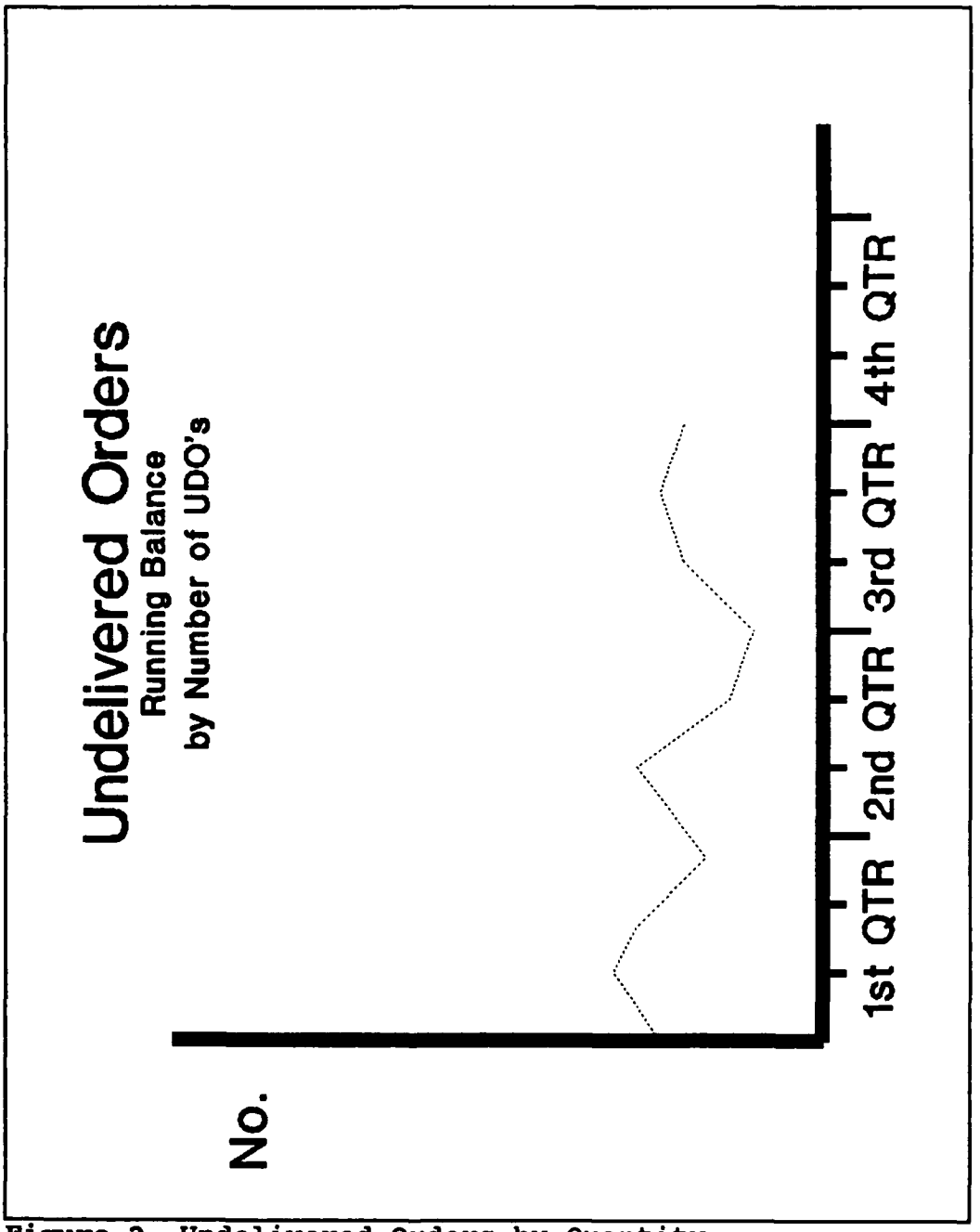

Figure 2 Undelivered Orders by Quantity

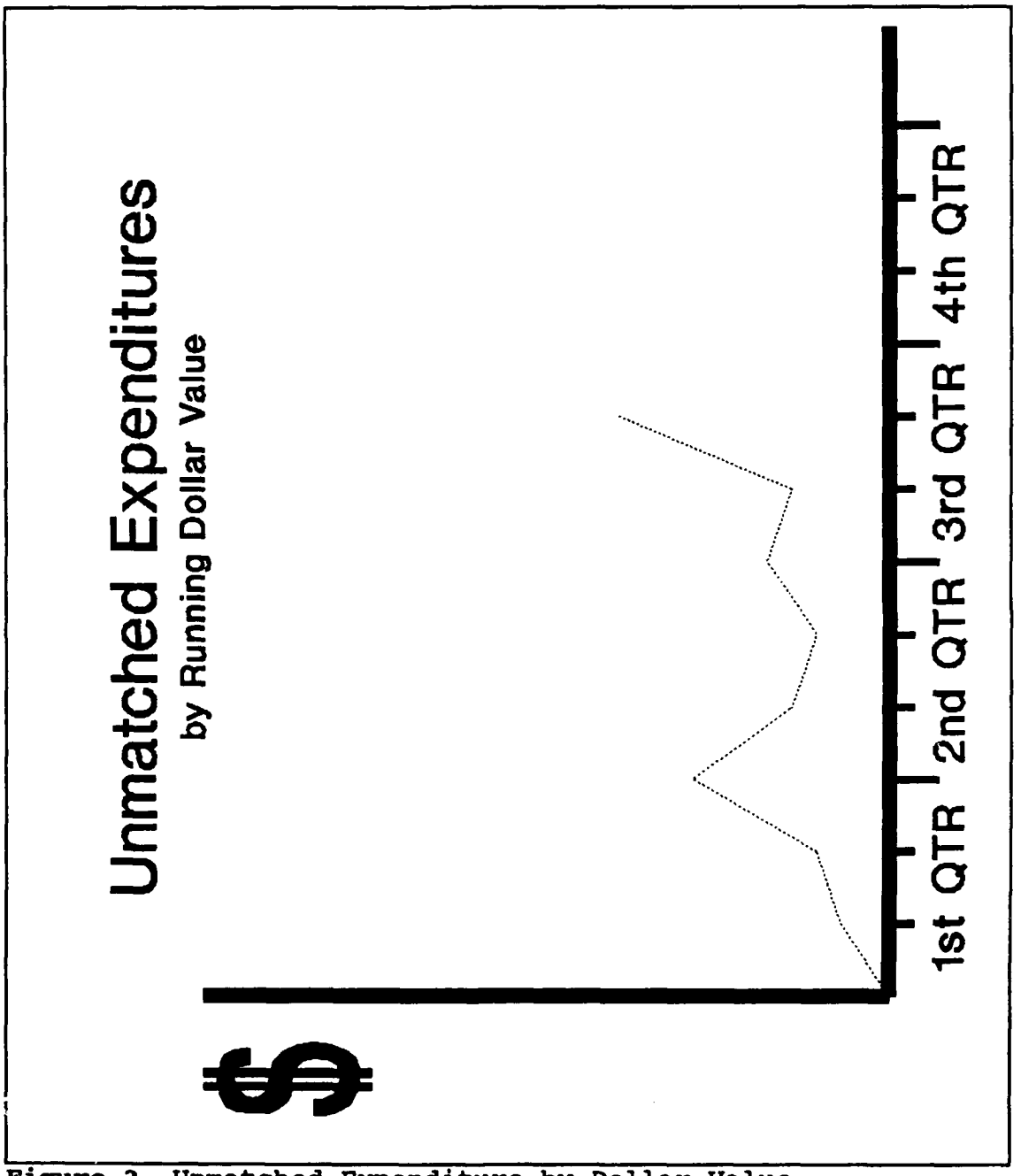

Figure 3 Unmatched Expenditure by Dollar Value

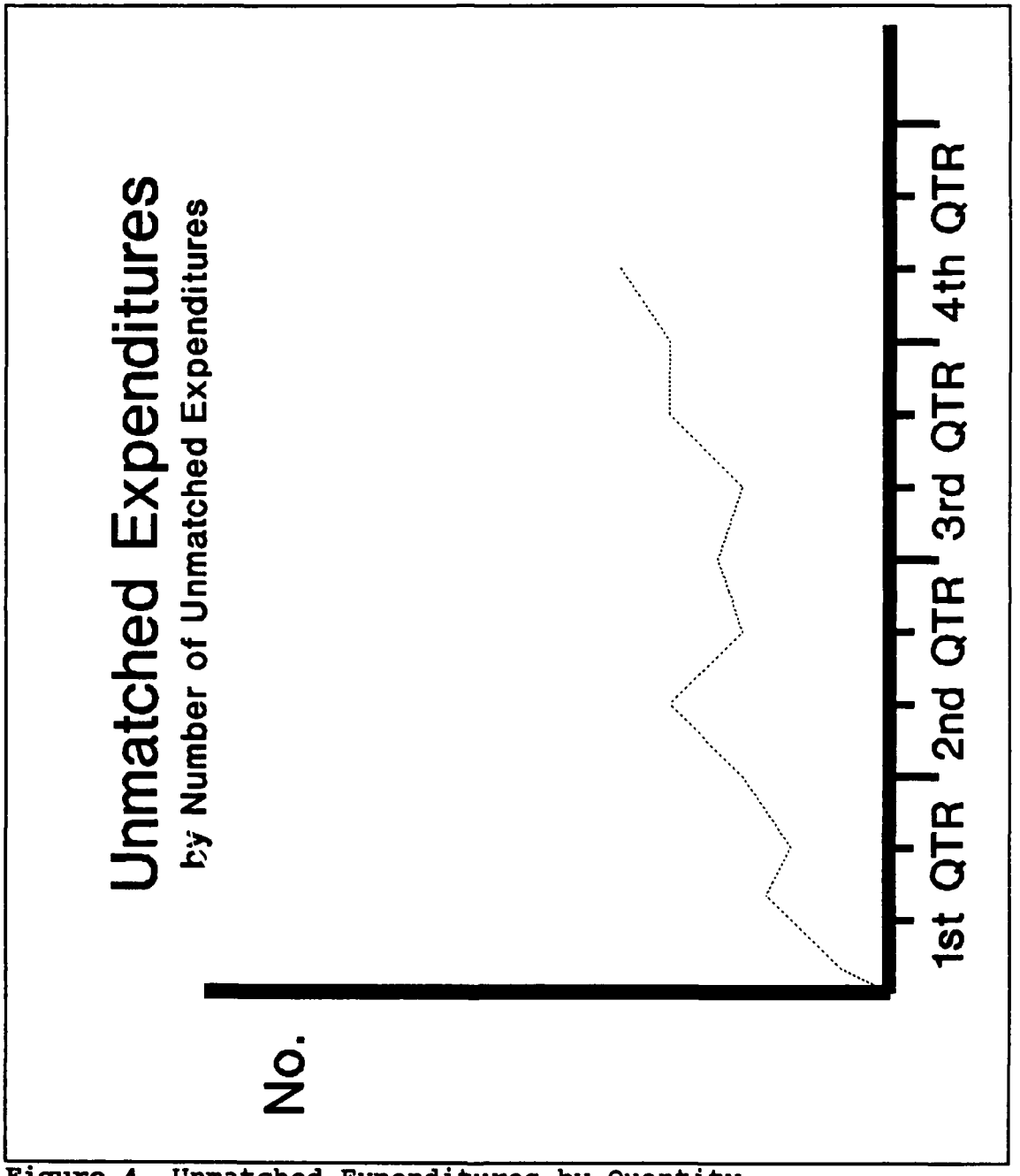

Figure 4 Unmatched Expenditures by Quantity

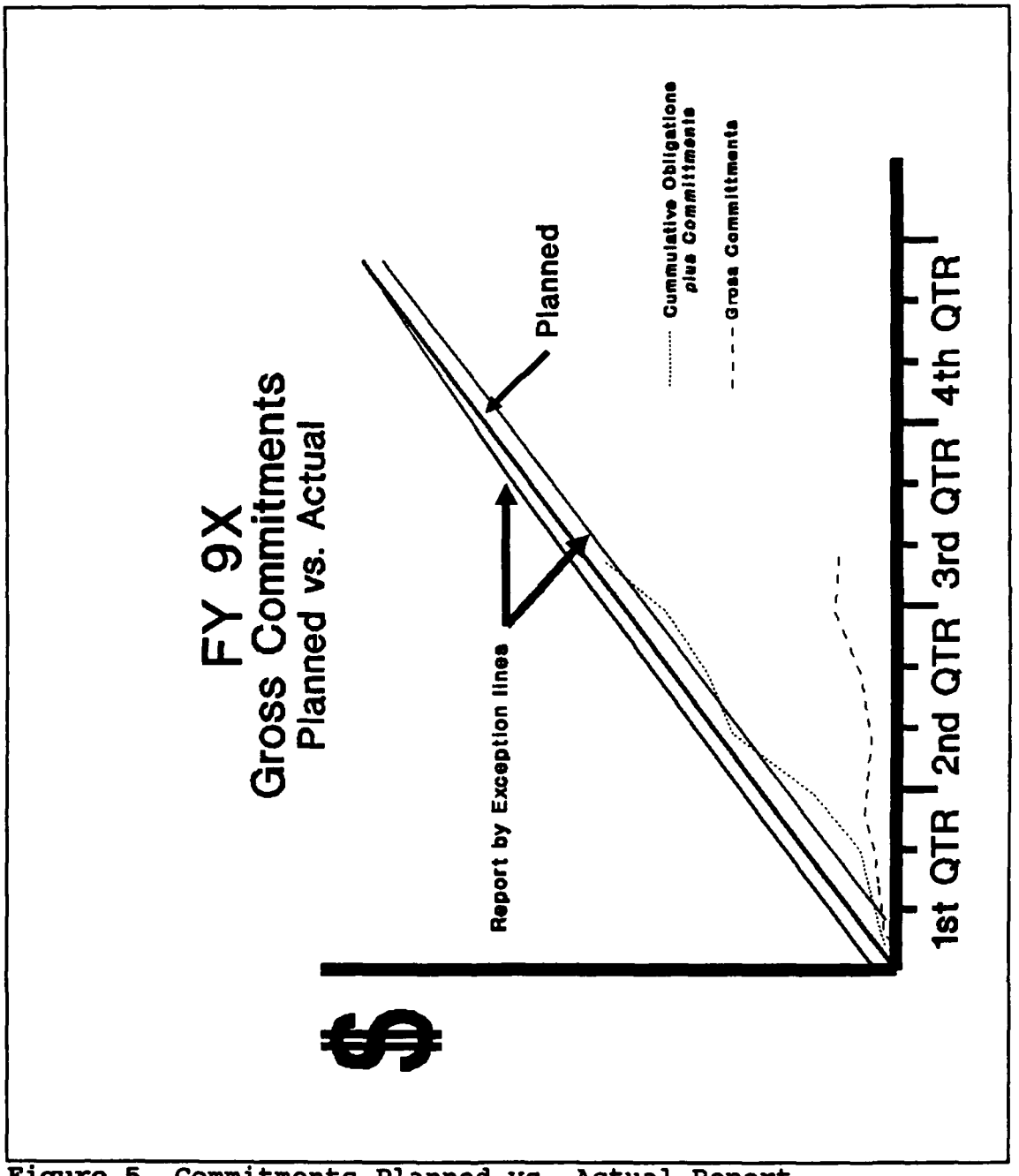

Figure 5 Commitments Planned vs. Actual Report

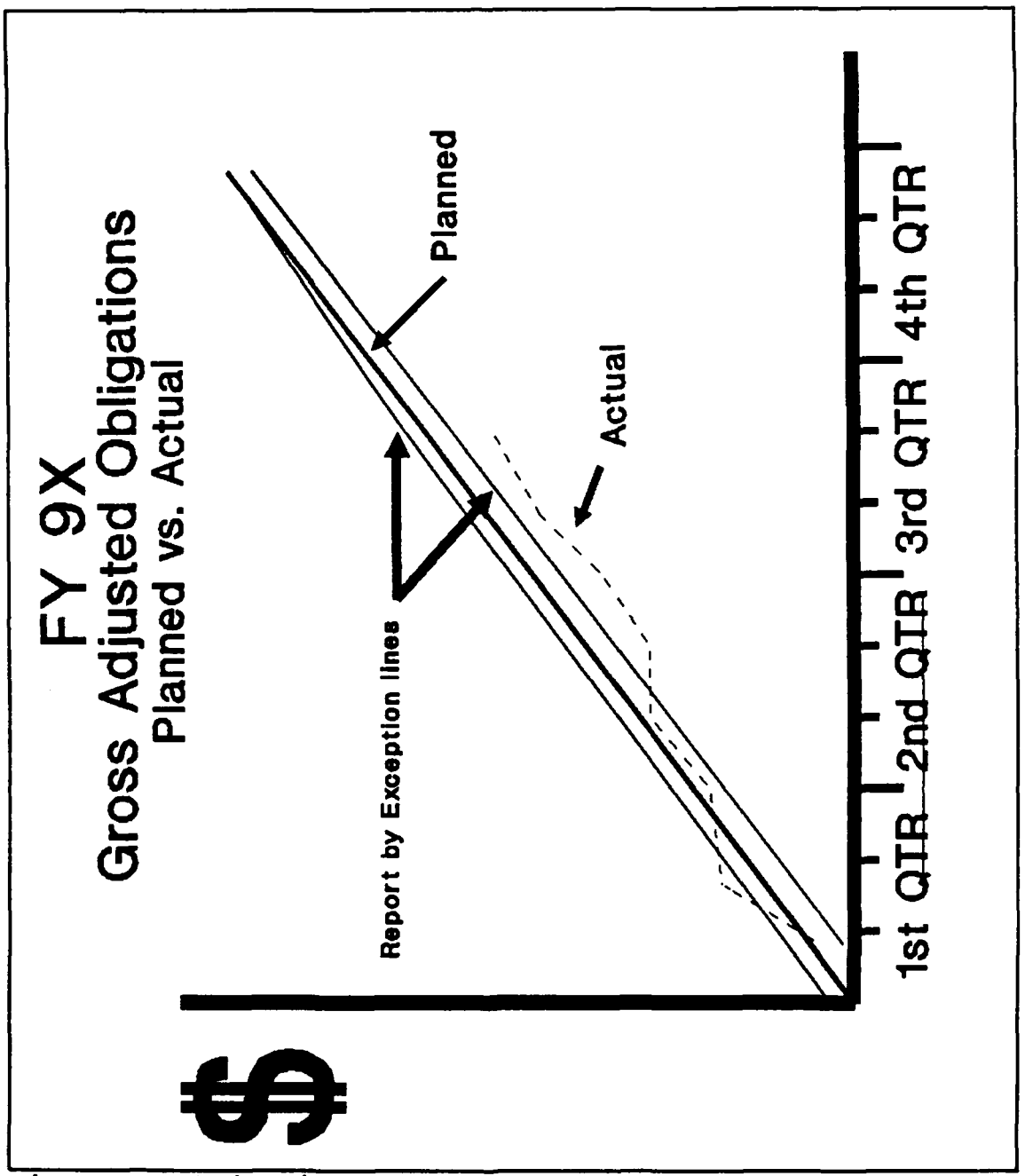

Figure 6 Obligations Planned vs Actual Report

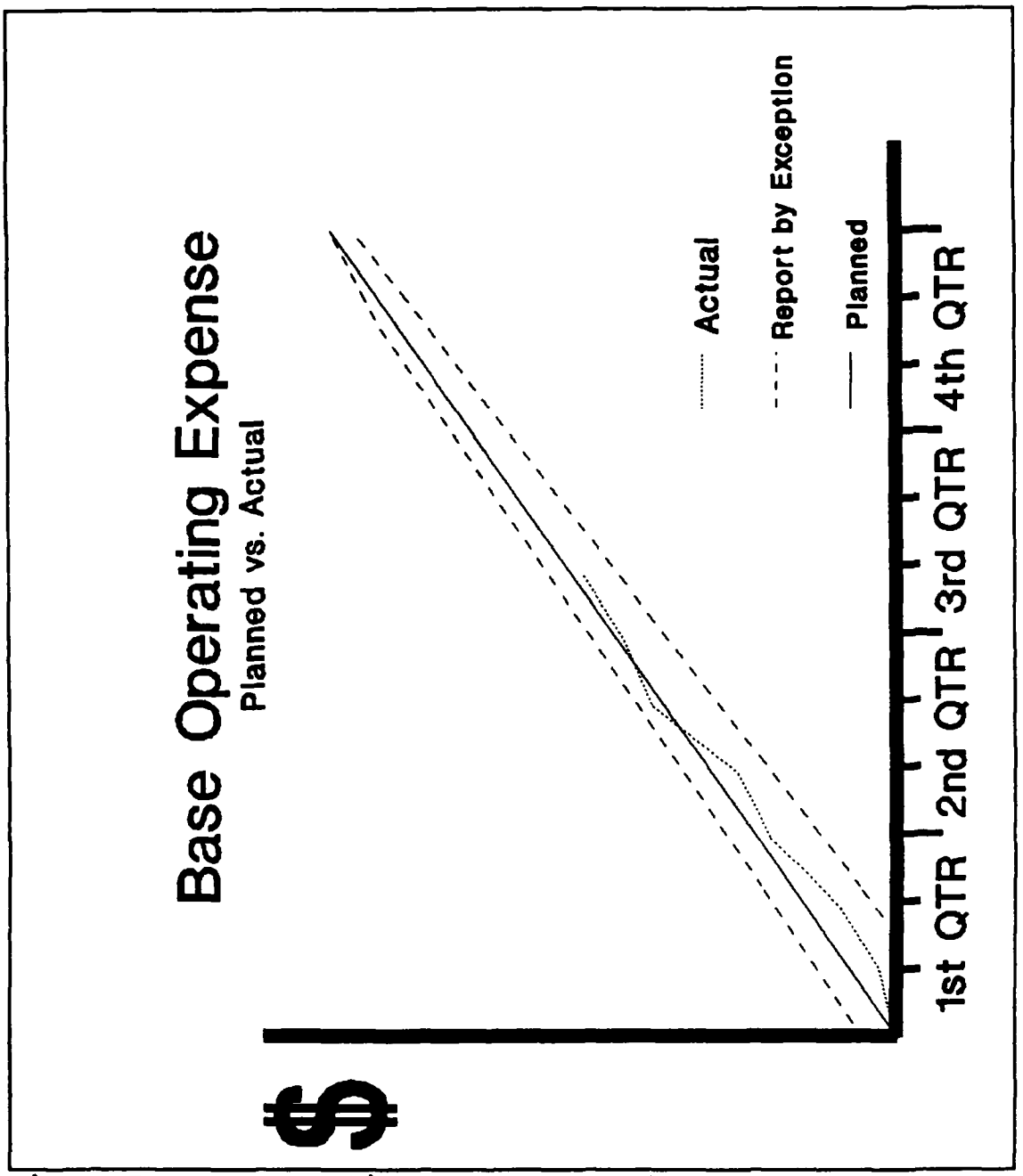

Figure 7 Base Operating Expense Report

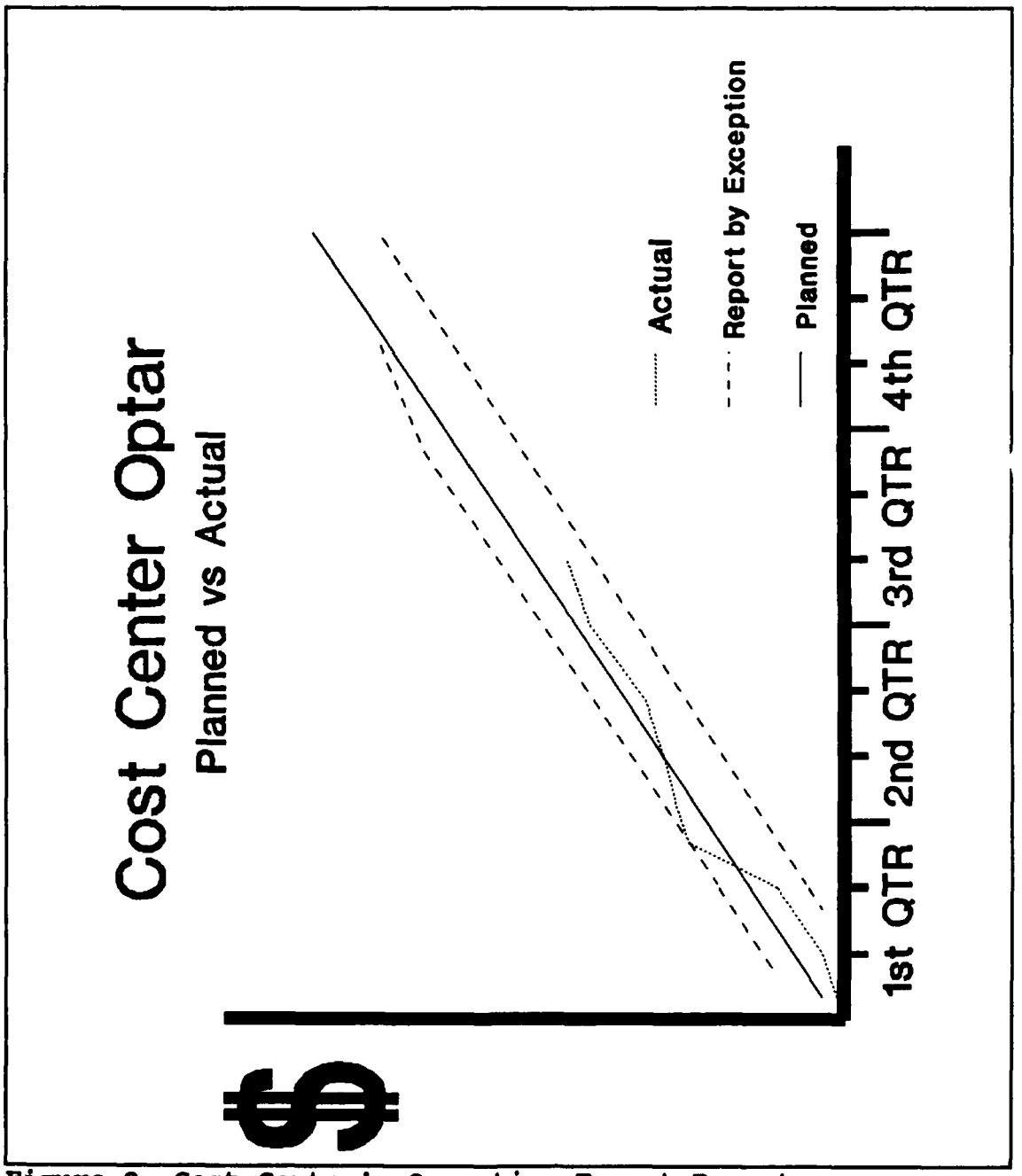

Figure 8 Cost Center's Operating Target Report

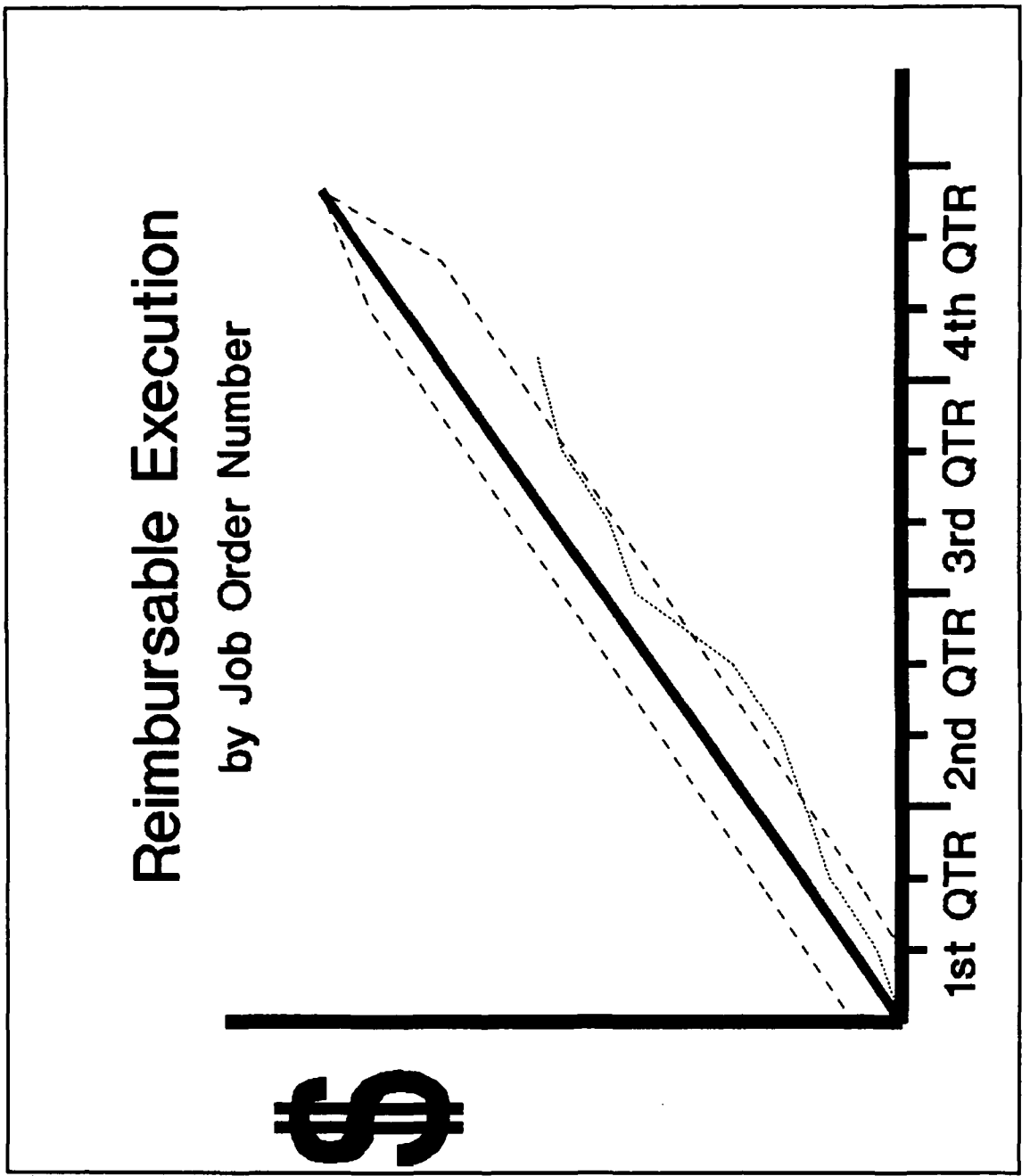

Figure 9 Reimbursable Report

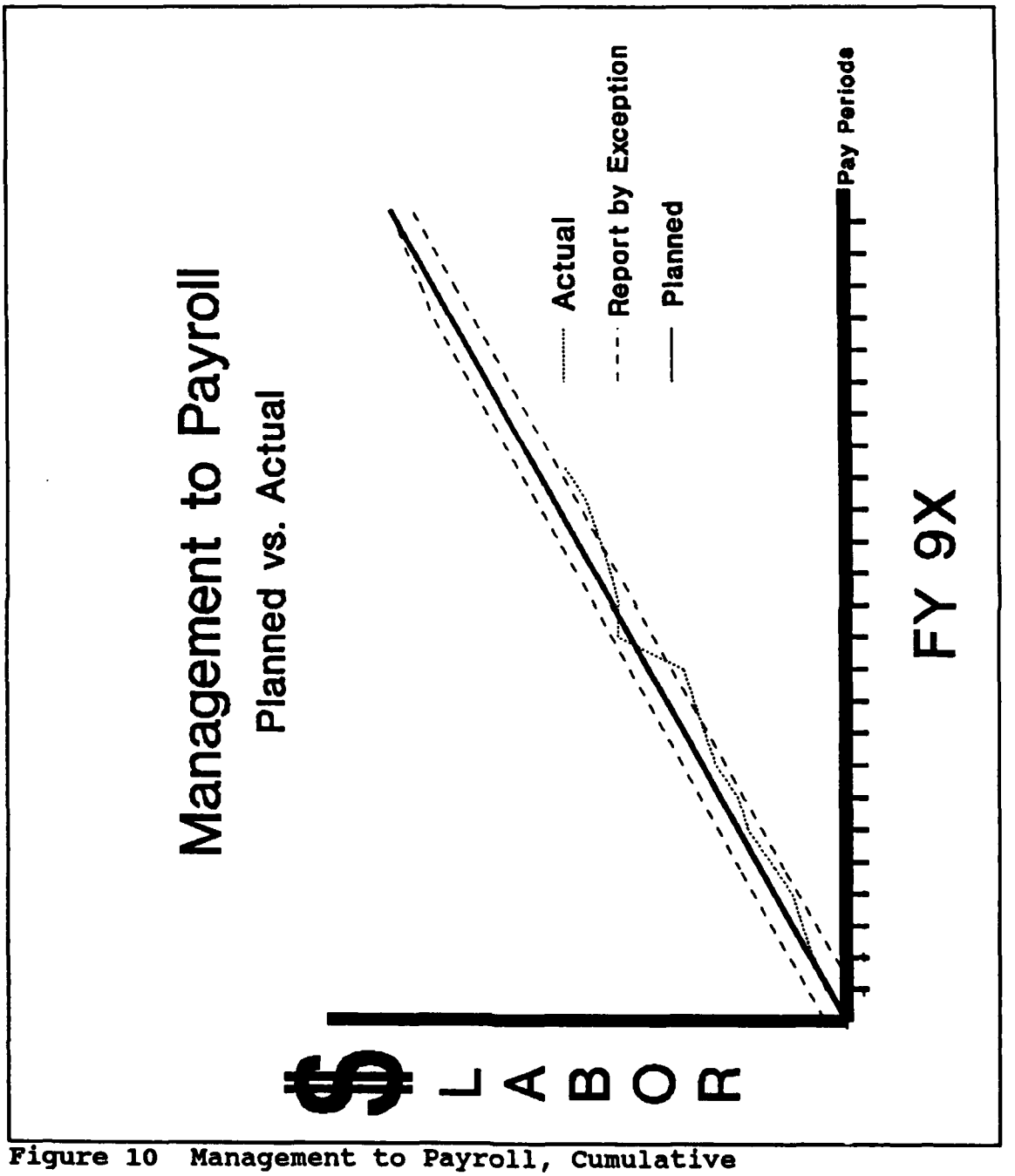

Figure 10 Management to Payroll, Cumulative

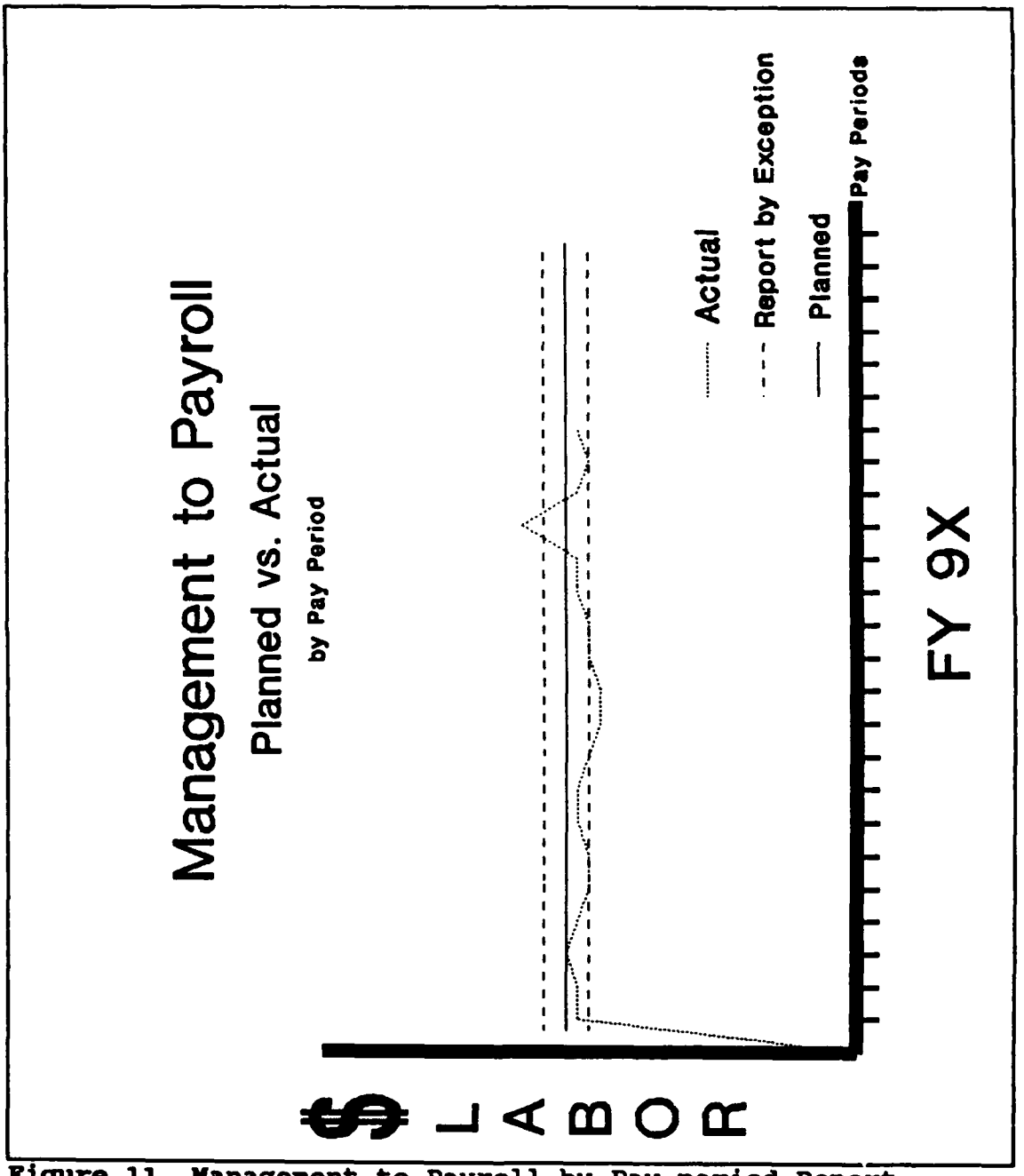

Figure 11 Management to Payroll by Pay period Report

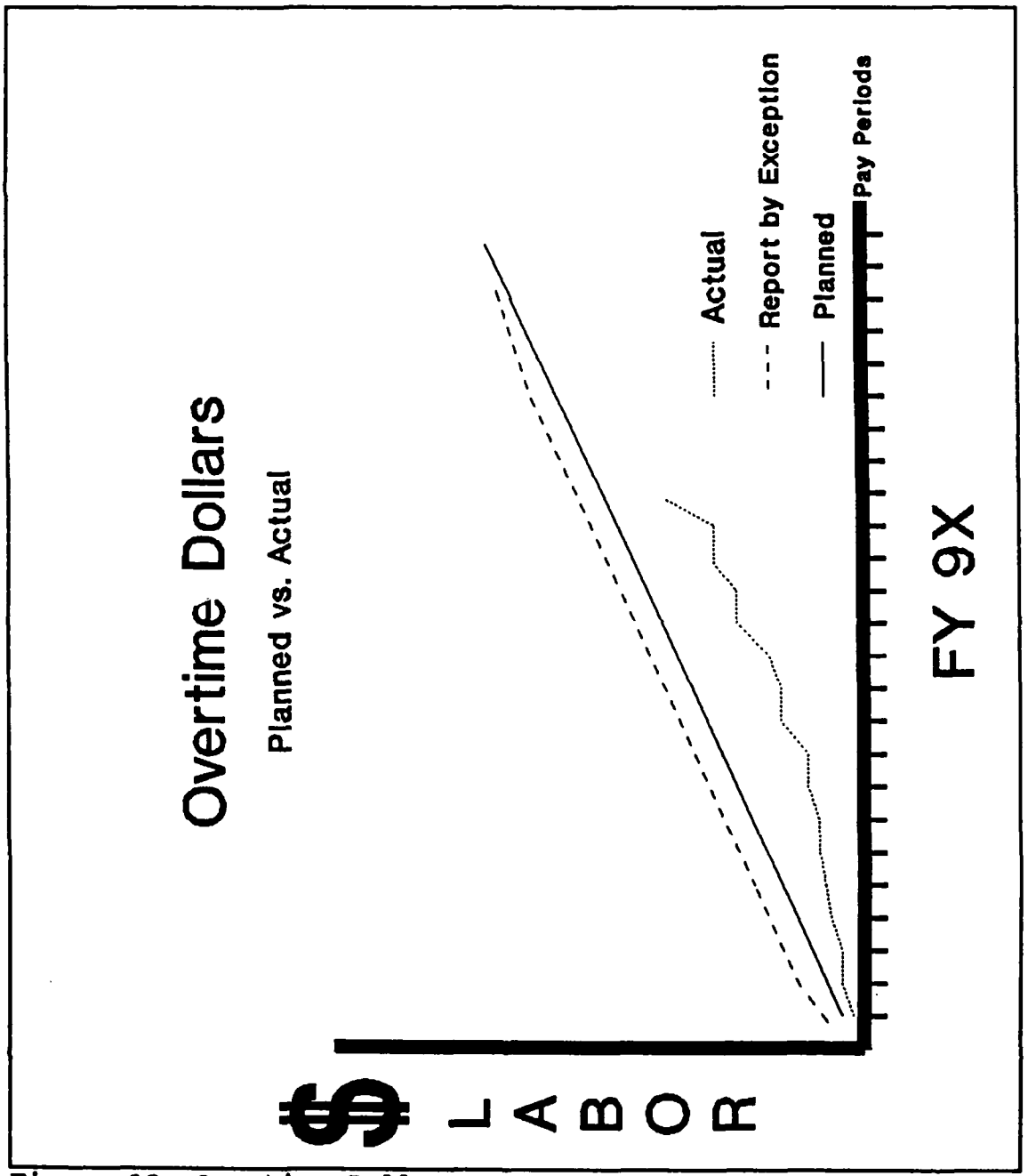

Figure 12 Overtime Dollars Report

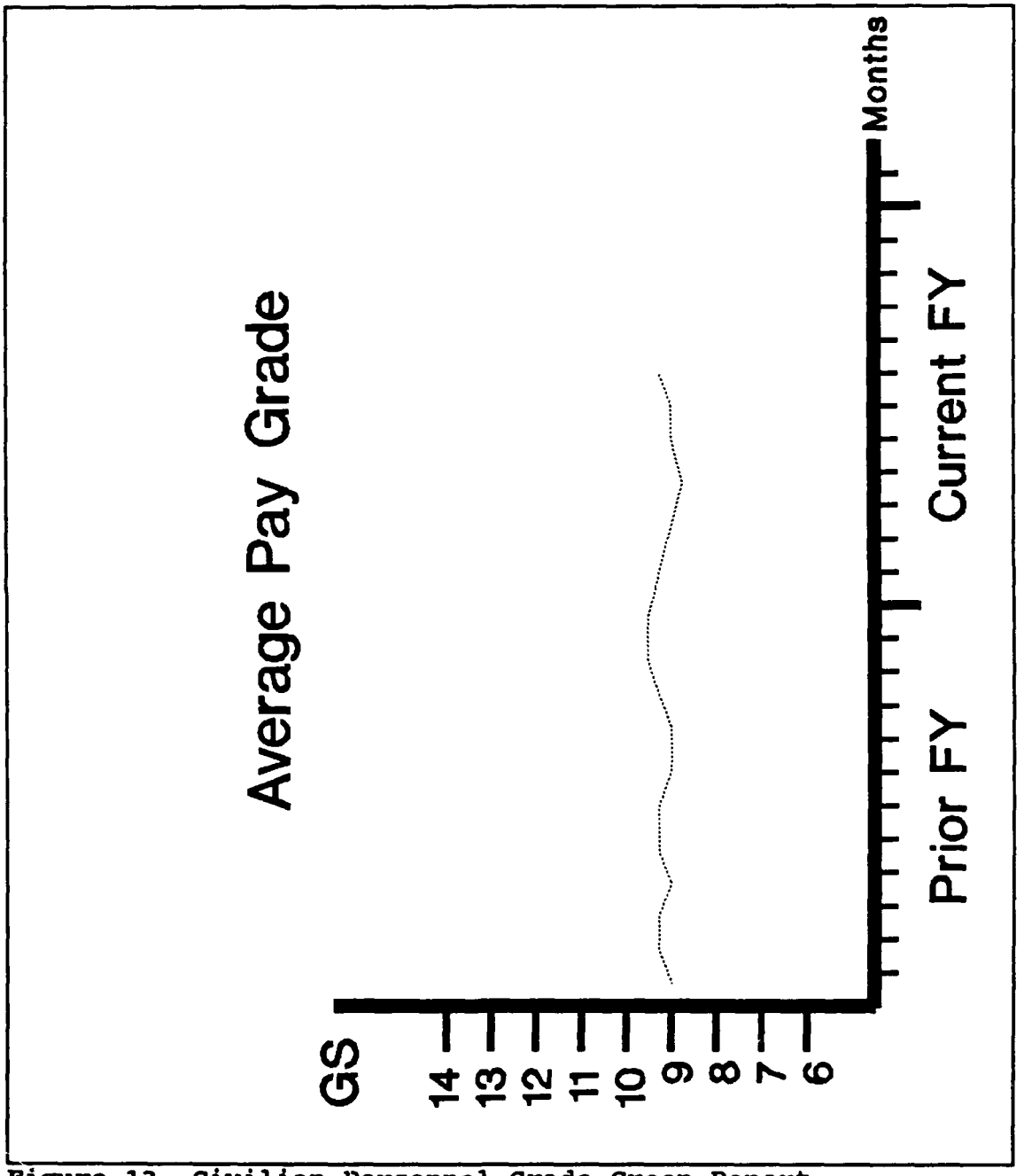

Figure 13 Civilian Personnel Grade Creep Report

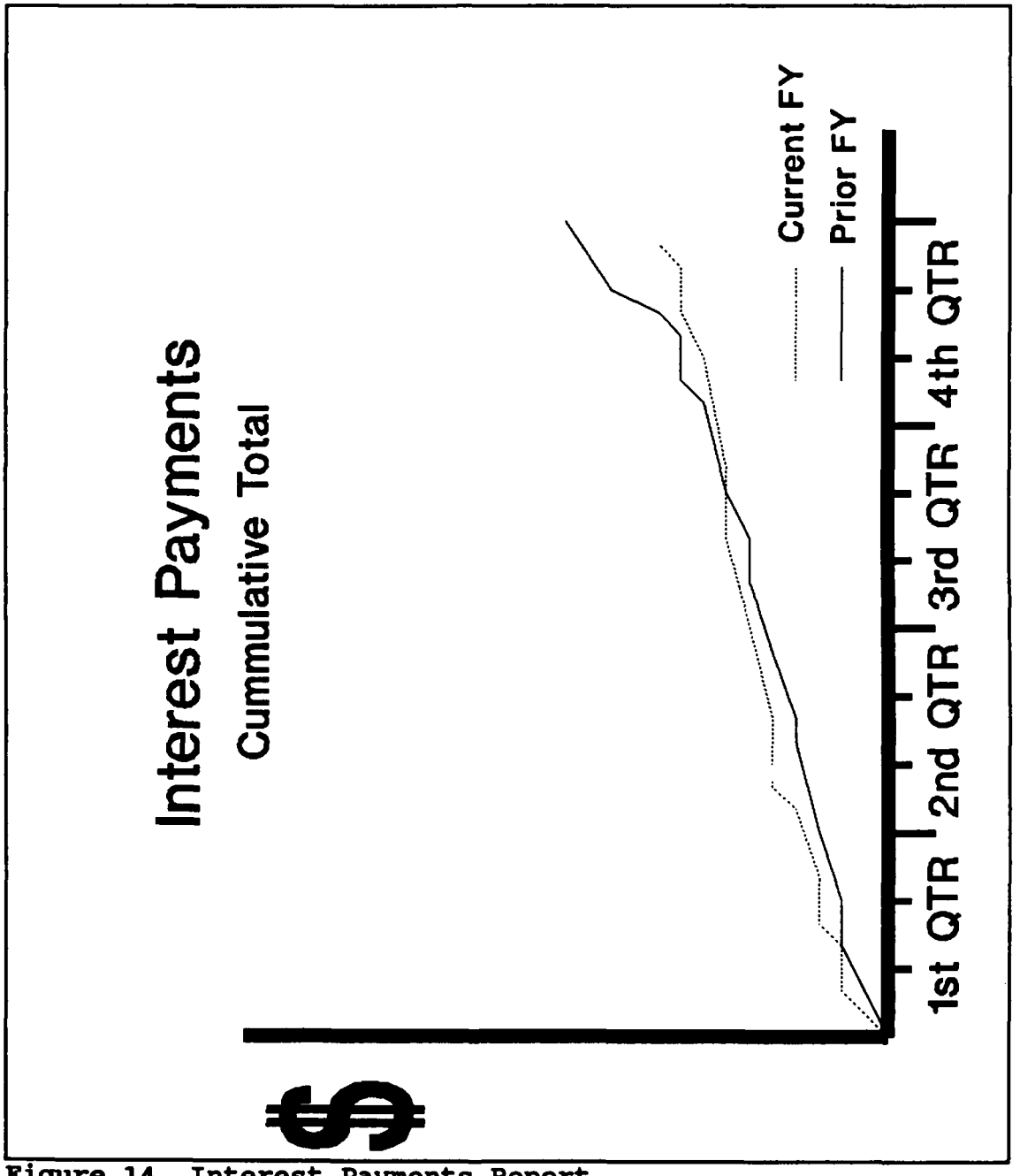

Figure 14 Interest Payments Report

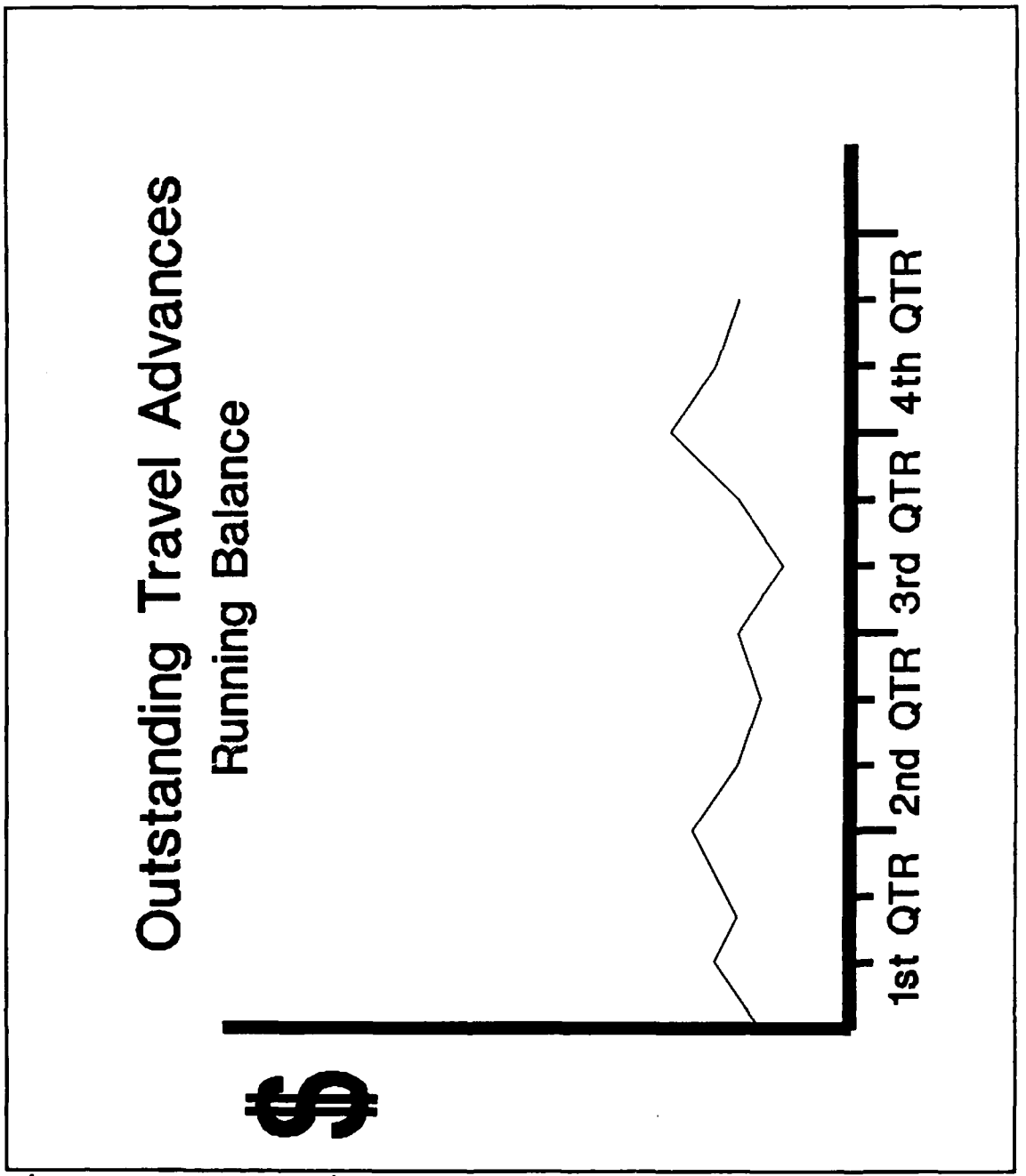

Figure 15 Outstanding Travel Advances Report

APPENDIX B - PRACTICAL COMPTROLLERSHIP COURSE AND FINANCIAL MANAGEMENT OF THE ARMED FORCES STUDENT TEXTBOOK SUPPLEMENT: AUTOMATION OF A FINANCIAL MANAGEMENT INFORMATION SYSTEM

Based upon comments from students attending the Practical Comptrollership Course at the Navy Postgraduate School it was apparent that there were many misconceptions as to what an automated financial management information system (AFMIS) is, what it should be, and how to develop one. This paper is based upon a review of several Navy shore activities and their Financial Management Information Systems (FMIS).

This paper first addresses what management information is, then what a AFMIS should provide with respect to management information. The final chapter discusses how to approach the development of an AFMIS.

There are four appendixes to this paper. Appendix AA, is a proposed check-off list that a command could use during the initial phases of developing an AFMIS. The check-off list is designed to assist an organization in starting off in the right direction of initiating the development effort within their command. Appendix BB is a listing of lesson's learned by various shore activities that implemented an AFMIS. Appendix CC contains sample management information reports that an AFMIS should provide.

Appendix DD is a general discussion on what a computer is and how it works. It is oriented towards those that have very little experience or knowledge as to how computers operate. Appendix DD is not intended to serve as an extensive guide on computers, there are various books on the market addressing this particular topic.

I. MANAGEMENT INFORMATION

A. MANAGEMENT INFORMATION SYSTEMS

There is a difference between a Management Information System (MIS) and an Automated Management Information System (AMIS). MIS is any standardized approach to accumulating data and adjusting/manipulating the data in a manner that is useful to an organization. This includes: personnel files; payroll records; financial status of the organization; work schedules; etc.

An Automated MIS (AMIS) is a computerized system that accepts input from various sources and manipulates the data to generate useful information for management. Depending upon the size of a requirement, an automated system could be operated on a computer as small as a micro-computer (desk top computer) or as large as a mainframe computer at a computer center.

B. COMPTROLLER MANAGEMENT INFORMATION REQUIREMENTS

When trying to identify what management information is required to support a comptroller, three questions need to be answered: 1) What information needs to be reported to the Commanding Officer, Executive Officer, Department Heads, and the Comptroller, so that they can effectively execute the responsibilities of their offices. 2) How should the information be presented. The method of presentation can directly affect how they will interpret the information, and the amount of effort required by management in reviewing the information. 3) How often should the information be presented? Should management review every report on a weekly basis? Or, should they review only

selected reports on a periodic basis. Should exception reporting be used? The latter two questions are addressed first, followed by what is considered the minimum management information that is required in an AFMIS.

1. How the Information Should be Presented

Management is required to be aware of the status of a multitude of financial accounts, appropriations, and special interest items. They must be able to review these various areas in the most efficient manner possible. The trend in the commercial sector has been towards the utilization of graphical presentations in management information systems. In 1986, sixty-seven percent of all reviewed MIS's used computer graphics. Graphics, if presented properly, have the ability to depict trends more clearly to management, compared to the same information that is displayed in a column format in a report. [Ref. 7:p. 61]

2. How Often the Information Should be Presented

Management's time is a precious resource, therefore, we want to focus their available time on the most relevant information within the organization. Management does not have the need, or is capable of, reviewing every report that is generated every day. There are certain areas of the operation that requires management's attention on a daily basis, but there are other areas that require only occasional review to ensure that things are on track. A management information system should help management in deciding what does and does not require their attention. [Ref. 8:p. 19]

Managerial reports fall into three report generation frequency categories: 1) routinely scheduled reports; 2) reports by exception; 3) reports provided upon request. Each are discussed below.

a. Routinely scheduled reports

If the reports are for providing comfort information then the reports should be generated on a routine, periodic basis. An example of this type of report would be the Status of Funds report that would be presented to the Commanding Officer on a weekly basis.

b. Reports By Exception

If the report is for highlighting potential problems, then the report might be more appropriate on an exception basis. An example of this would be the monitoring of the use of overtime. If the planned overtime budget is exceeded by a certain percent, the report is automatically generated for managements review. This form of exception reporting also works well with monitoring the cost center optar balances and accounts that have special restrictions.

c. Reports Generated Upon Request

The type of reports that could be in this category are trend analysis reports. These reports could be tailored to meet the planning information requirements for budget preparations, or "what-if" scenario's.

3. Automated Management Information System Reports

The Comptroller's AFMIS needs to meet the following information requirements [Ref. 8:p. 19]:

- Replicate the financial summary data that the major/sub claimant is reviewing.
- Generate summary charts for presentation to the Commanding Officer, Executive Officer, and department heads. These graphs will provide comfort and/or warning information.

- Generate summary information graphs of high interest or sensitive areas.
- Generate summary charts for monitoring the internal operation of the Comptroller department.

The frequency and distribution of these various types of management graphs/reports would vary for each command. The following management information reports are considered to be the minimum reports of an AFMIS [Ref. 1:p. D98, 6:pp. 9-10, 8:pp. 19-20].

- Undelivered Orders Reports (Appendix CC Figures 1 and 2)
- Unmatched Expenditures Reports (Appendix CC Figures 3 and 4)
- Obligation and Commitment Report (Appendix CC Figure 5)
- Obligations Planned vs. Actual Report (Appendix CC Figure 6)
- Base Operating Expense Report (Appendix CC Figure 7)
- Cost Center Operating Target Report (Appendix C Figure 8)
- Reimbursable Execution Report (Appendix CC Figure 9)
- Management to Payroll Reports (Appendix CC Figures 10 and 11)
- Civilian Overtime Dollars Report (Appendix CC Figure 12)
- Civilian Personnel Grade Creep Report (Appendix CC Figure 13)
- Interest Payments Report (Appendix CC Figure 14)
- Outstanding Travel Advance (Appendix CC Figure 15)

C. COMPATIBILITY OF FINANCIAL MANAGEMENT INFORMATION SYSTEMS

Compatibility is a critical aspect of any automated information system. When an information system involves more then one computer system, the question of compatibility arises. Compatibility of computer systems have two

areas of focus; compatibility of hardware (computers) and compatibility of software.

Micro-computers are in use at both the cost center level and the comptroller department level. If an AFMIS system is going to encompass these two levels of the organization then the hardware configuration must be compatible, otherwise the sharing of programs and data would not be easily accomplished. Hardware compatibility is also an issue between a Comptroller's AFMIS and the IDA system.

As with hardware, software within an AFMIS must also be compatible. If information that is entered in one part of the AFMIS is intended to be used in another part of the AFMIS, then the different software components that share this data must be compatible (data must be stored and retrieved in a format that is recognizable by the two systems). With out direct compatibility, an additional program might be required to modify the format of the data from one program to another so that the data can be used. Or worst case, the data will not be transferable due to lack of compatibility.

An organization's AFMIS ideally should be compatible with the FIPC's official accounting system. An AFMIS should have the capability to electronically receive (download information) and transmit (upload information) data between the two systems. An AFMIS should also be compatible between a comptroller's and cost center's AFMIS. A comptroller's AFMIS should have the capability of receiving, electronically, financial data from the cost centers and the cost centers should be able to receive data from the comptroller's AFMIS.

II. HOW TO DEVELOP AN AFMIS

A. DISCUSSION

The effort involved in developing an AFMIS is often underestimated by both management and users. The investment of both time and money needs to be recognized up front, prior to undertaking the effort of automating a FMIS. Without properly recognizing this, it will be difficult for management to adequately support the project. Management's commitment to the development effort and cost incurred throughout the development period often determines the level of success as to quality of the completed system [Ref. 10:pp. 263-264].

1. Development Methodologies

There are several industry accepted methodologies as to how to approach the development of an automated information system. A methodology is a framework for guiding a software development project from conception to completion. The methodologies fall into two basic categories: System Development Life Cycle; and Prototyping. [Ref. 5:pp. 603]

The System Development Life Cycle (SDLC) approach is a traditional methodology that has been extensively used over the years. SDLC is a specific step by step process for developing the system. A distinctive feature of this approach is that once the developer identifies the requirements that the user **thinks** he/she wants, the software development team goes forward with the development of the application. The user's involvement with the SDLC methodology is limited to the initial requirements phase and the acceptance of

the product. It is not until the latter part of the development effort that the user gets to actually see what the end product is going to look like. If the user finds out at this point that they didn't correctly identify all of the requirements that they wanted in the system, it is often too late, or too costly, to change. The Prototyping methodology, in contrast, assumes that the user is not able to accurately identify the requirements of the system up front. Prototyping is an approach that keeps the user involved throughout the development process. This approach requires both the user and the developer to sit down and review what the user likes and dislikes with the current system in place. From this the developer creates a working model (prototype) that emulates what the developer thinks the user wants. The user reviews the prototype and tells the developer what he/she likes and dislikes about the system. Based upon this review the developer modifies or creates a new prototype for the user to review. This process continues until the user is satisfied with the presented prototype. With this information, the developer can now go forward and develop the working system, now knowing what features are desired in the system. [Ref. 5:pp. 603-613]

2. Determining System Requirements

A manager's ability to make quality decisions is directly related to the quality and availability of information that pertains to the issue at hand. Without having the right information at the right time, a manager is unable to carry out his/her responsibilities effectively. This identifies two general attributes of information. The information must be "the" information that the manager needs for the particular decision making process that he/she is

encountering. And, the information must be timely. Timeliness is crucial, receiving the information when there is not adequate time for the manager to take advantage of a situation, or to correct a problem is unacceptable.

All managers have different ideas as to what information is needed, and when the information is needed, in any given situation. The variances stem from some managers having a better feel for a particular situation, or maybe having a better understanding as to what information is most relevant. Also the level of experience of the manager will impact the managers information requirements. Depending on the level of diversity in the organization and the dynamics of the business routine, information requirements could range from a very stable (a very systematic and well established routine), to a very dynamic organization that has continually changing information requirements.

A key element in obtaining the system that the user needs is knowing what the user wants in the system. Management knows that they need information to be able to accomplish their jobs, but the ability of managers to clearly state what information they need on a routine, periodic, or on a ad-hoc basis, is often very difficult [Ref. 11:pp. 98-99]. Without clearly identifying what is expected out of an AFMIS prior to the development of the system, it is unlikely that the system being developed will meet the needs of the organization.

Critical Success Factors (CSF) is one approach that can assist the development team in determining the users requirements. CSF's are important functions within the organization that must achieve a minimum standard to be considered successful. CSF's are derived through a series of interviews, focusing on what is necessary for the interviewee to be successful within their position.

By determining what the CSF's are, it is possible to determine the information requirements for supporting those CSF's. [Ref. 12:pp. 6-8]

Utilizing only the CSF's is not enough for the purpose of identifying all of the requirements of an AFMIS. The utilization of questionnaires for management to respond to, will provide an addition means of evaluating the information needs of management. The questionnaire will provide for a standard means of comparison between managers to evaluate the overall needs of the organization. [Ref. 4:p. 115]

Another source for determining information needs is by collecting all currently prepared reports within the organization. This should include both currently automated reports and manually prepared reports.

3. Prioritization of Information Requirements

Once all of the requirements are identified for the proposed new system, it is important to place priorities on all of these requirements. The importance of this is that it might not be economically, or technically feasible to accomplish all of the functionality of the requested system. Without a priority listing, approved by management, the development team may incorrectly choose which application to develop and which ones not to develop.

4. Taking Inventory of Existing Hardware and Software Systems

Determining the hardware systems that are currently within the organization will influence the development of the system. With an inventory of the existing computer systems, the developers will be able to determine if the existing hardware can be utilized with the new system or if the existing

hardware will need to be replaced. The compatibility of hardware systems is also an important concern during the development process.

Taking inventory of the existing software applications within the organizations is important for two reasons. First, if there are applications currently in place that will be replaced by the new system, there will be a requirement for converting the current system and information over to the new system. Second, some of the current applications might be usable in the new system. Reusability of current applications could reduce both the development time and cost.

5. Evaluating the Feasibility of the Proposed System

Throughout the development process, it is important to incorporate feasibility check points to ensure that the project is both feasible and affordable. With any system development project, the initial estimates are often inaccurate. As the development of the system progresses, better estimates can be made. The development team should be required to provide the requesting activity with the projected estimates of the project on a periodic basis.

With each feasibility report, the requesting command should closely review the revised estimates. The activity may find that the project is becoming to costly, based upon how it is currently proposed. Decisions of reduction of scope or even cancellation of costly projects should be viable alternatives within the decision making process.

6. Use of "Off-the-Shelf Software" vs. In-house Development

In-house developed software is software that is specifically developed for a given system. In-house development requires the full development

approach which includes: determining the users requirements of the system; determining the logical design of the system (determining the specifications of the requirements); programmers writing the programs for the system; program testing; implementation of the system; and maintenance of the system. In-house development can be performed by the local commands computer specialists, a Navy Regional Data Automation Center (NARDAC), or a commercial contractor. This is traditionally a very lengthy and expensive process.

An alternative to In-House development is "Off-the Shelf" (OTS). There is a multitude of OTS software products in the commercial market. If possible, the use of an OTS application can possibly reduce the time and expense of a project. With the vast number of available OTS applications in the commercial market, it is likely that there are OTS applications that, with some minor modifications, could meet the needs of the system that is being developed. To use OTS, it is still necessary to go through the requirements phase of the development process. With out doing this, it would not be possible to adequately determine which OTS could meet the requirements.

B. RECOMMENDED FRAMEWORK OF AN AFMIS

An AFMIS, ideally, should encompass all three levels of the financial accounting system. That is, the system should be an integrated application that links the cost centers with the Comptroller department, and the comptroller department with the FIPC system. The framework that is recommended here is a generic framework that can serve as a tool for activities to conceptualize an

AFMIS. Figure 1 illustrates the Integrated AFMIS Framework. The framework is briefly discussed here at both the comptroller level and the cost center level.

1. Cost Center AFMIS

a. Entry of Obligations

Ideally an AFMIS should promote the philosophy of "one time data entry". That is, data should only have to be entered into the AFMIS once. All other functions that need to utilize that data should be able to have access to it via the AFMIS.

The concept of one time data entry should be introduced at the cost center level. The cost centers are the origination points for initiating obligations. Since cost centers need to keep track of their obligations in their local accounting system (cost center memorandum records), the entry of the obligation into their AFMIS should also serve as the data entry into IDA (after review by the Comptroller's accountants).

If properly developed, the AFMIS (at the cost center level) can have detailed error checking routines for validating the information that is being entered. By validating the data at the cost center level, data entry errors can be reduced. If errors are encountered, the user can correct the discrepancy at the terminal.

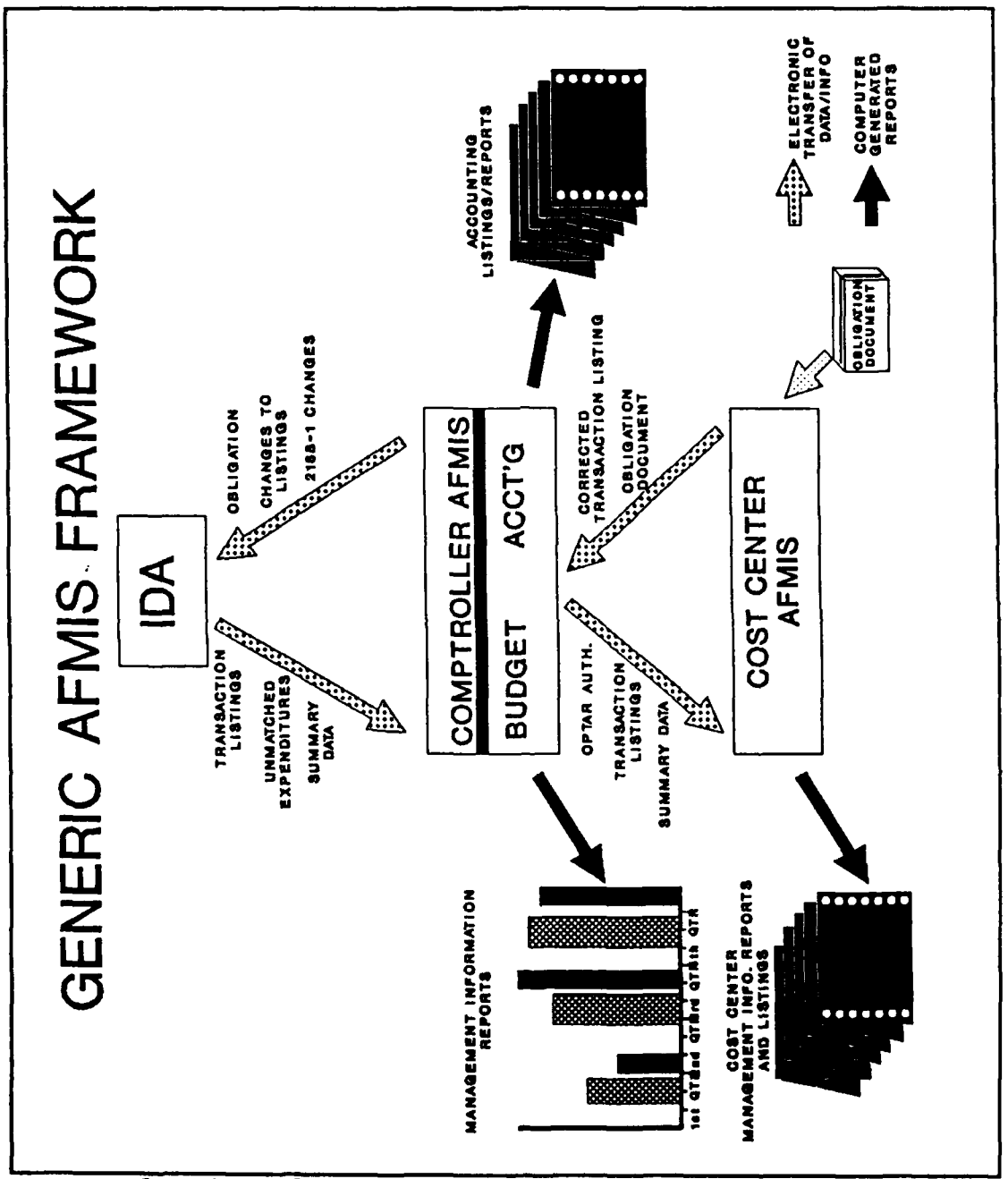

Figure 1 Generic AFMIS Framework

b. Transaction Listings

Transaction Listings (TL) should be automatically forwarded to the cost center AFMIS via electronic means from the Comptroller's AFMIS.

The cost center's AFMIS can be developed to automatically compare the TL's with the information contained in the local AFMIS. The AFMIS should be able to assist in the reconciliation of the TL's, and generate a hard copy listing of those TL's that require further action.

Once the TL's are reconciled, the AFMIS should pass the corrections to the Comptroller's AFMIS for review and approval for updating the IDA system.

c. Cost Center Report Generation

The local AFMIS should be able to generate management information reports for the cost center's management. These reports should be able to be tailored to the particular needs of the cost center.

2. Comptroller AFMIS

a. Entry of Obligations

With obligations being entered at the cost center level, the Comptroller's accountants will serve as a review point for these obligations. The accountants will receive the obligations via the AFMIS. The obligations will be reviewed on the monitors by the accountants and if no discrepancies are noted, the obligations are forwarded onto the IDA system. If discrepancies are identified, the obligation is rejected and sent back to the cost center for correction, via the AFMIS.

Two accounting functions are taking place upon completion of the review of the obligations by the accountants: First, the activities memorandum records are being updated; Second, the IDA system is being updated.

b. Transaction Listings

Transaction Listings should be electronically received from the FIPC system. Upon receipt of the TL, the Comptroller's AFMIS should sort the TL into cost center sequence. The sorted TL is then forward to the cost centers for corrective action.

Once the cost centers have reconciled the TLs, the Comptroller's accountants will review the corrections via the AFMIS. If no discrepancies are identified, the corrections are transmitted to the IDA system for update.

c. Management Information Reports

The report generation capability should be flexible so that it can be adapted to meet managements needs. Also, with the Comptroller's AFMIS monitoring the daily transactions at both the activity level and the cost center level, the AFMIS should be able to generate exception reports when the conditions warrant it.

APPENDIX AA - CHECK-OFF LIST FOR AUTOMATING A FINANCIAL MANAGEMENT INFORMATION SYSTEM

A. SOLICITING SUPPORT FROM TOP MANAGEMENT

____ Review command procedures for requesting the development of an automated information system. The local Data Processing Center will have guidelines for the proper submission of requests.

____ Obtain Command support for determining requirements of proposed system and conducting a feasibility study.

B. DETERMINING REQUIREMENTS OF SYSTEM

1. Copies of Current Reports

____ Obtain copies of all current financial reports (both automated and manual) used in the Accounting Division

____ Obtain copies of all current financial reports (both automated and manual) used in the Budgeting Division

____ Obtain copies of all current financial reports (both automated and manual) used by the Comptroller

____ Obtain copies of all current financial reports (both automated and manual) presented to the Commanding Officer, Executive Officer, and Department Heads.

____ Obtain copies of all current financial reports (both automated and manual) generated for submission to higher authority.

2. Input From Users as to the Desired Capabilities of the Proposed System

____ Determine the Critical Success Factors for each position affected by the system. Critical Success Factors is just one of many different methodologies to obtain what the bare minimum requirements would be from the users prospective.

____ Use a questionnaire to solicit desired user requirements. The questionnaire format should be in a manner that will lend itself for comparison with each other once returned from the user.

____ Consolidate all user identified requirements, then have the users determine the priorities of the requirements that they requested.

C. TAKE INVENTORY OF EXISTING SYSTEMS

____ Take a detailed inventory of all computer hardware currently in-place (computers, printers, modems, monitors, etc.). The inventory should depict type of equipment, quantity, and location.

____ Take a detailed inventory of current applications in use. The inventory should include type of application, location, frequency of use, who the users are, and the intended use of application.

D. INITIAL FEASIBILITY REPORT

____ Does the feasibility report address compatibility of the proposed system between the Comptroller Department and the Cost Centers?

____ Does the feasibility report address compatibility of the proposed system between the Comptroller Department and IDA?

____ Does the feasibility report address the cost of additional hardware requirements?

____ Does the feasibility report address alternative approaches to the proposed system?

____ Does the feasibility report address the development methodology? Will the development approach be Prototyping or System Development Life Cycle? Prototyping is highly recommended, due to the greater involvement of the user throughout the development process.

____ Does the feasibility study report the level of user involvement during the project?

____ Does the feasibility report address the anticipated conversion costs involved? These costs would include transferring over any data in the current system over to the new system and training the users on the new system.

____ Does the feasibility report address what the anticipated maintenance cost will be once the system is completed?

____ Does the report address the possibility of utilizing "Off-the-Shelf" software?

____ Does the feasibility report address the possibility of using existing applications within the proposed system?

____ Does the feasibility report address the possibility of incremental development? Can the system be developed by functional area and implemented once those areas are complete. New versions/releases of the application would

expand the capability of the system. This approach lends itself to organizations that do not have adequate funding for the entire project, but as money becomes available, additional modules can be developed and implemented.

E. DETERMINATION AS TO CONTINUE WITH THE PROJECT

____ Determine if the cost of the project warrants the continuation of the development effort.

____ Determine if the development time frame is acceptable. If there are significant changes in the future for how the organization will be required to manage their financial operation, then is it worth the cost and effort to develop the proposed system?

____ Are all requirements, identified by the users, going to be met? Are any of the requirements, determined by the development team, infeasible? If so, without these requirements is the system still worth the effort and cost?

APPENDIX BB - LESSONS LEARNED

The following lesson's learned are from Navy shore activities that have implemented AFMIS's. This list is provided so that it may assist an organization in their development effort of an AFMIS.

- Potential users were not correctly identified, this resulted in the application not meeting all of the user's requirements.
- The developers failed to identify what computer systems were available to the users. The developed application ended up not being compatible in all cost centers, which required the cost centers to procure additional equipment.
- Users where not involved in the development process. This lack of involvement resulted in flawed requirement specifications.
- Developers and users vocabulary are different. This resulted in misinterpreted requirements.
- The developed application required the cost centers to have a copy of a particular software package to use the AFMIS. Several cost centers did not have the required software package, and, did not have the funding to procure the required package.
- The developers of the application assumed that the users were familiar with computers and the selected "Off-the-Shelf" software. This lead to the development of an application that was too complex for the average user to use.
- During the programming of the application, the information that is used to validate the users input (for error checking) was programmed as part of the program's code in the software package. Without using look-up tables within the program (which is easier to modify) a new fiscal year required extensive reprogramming before the application could be used.
- Failure to field test the system prior to full implementation resulted in an unreliable product that users refused to use.
- The lack of scheduling formal training resulted in the implementation of the AFMIS with little support from the users. It was assumed that the

users would be interested enough in the new AFMIS to obtain, on their own, the training needed for the new system.

- Desk guides were not developed for users. This greatly hindered the implementation process and user acceptance.

- If an AFMIS is developed that has a high user acceptance, enhancements to the system must be planned and scheduled. It is very easy to continue to enhance an existing system, but this prevents the development of others applications that are competing for the same development resources.

- The development approach failed to keep the users involved through out the development process. This resulted in a loss of interest by the users, which made acceptance of the system, once implemented, more difficult.

- Use of the developed AFMIS at the cost centers was not mandatory. Therefore the cost centers refused to convert over from their old/familiar system to the new system.

- There was no documentation for the AFMIS. When the developer transferred, there was no one knowledgeable within the organization to maintain or update the software.

- Backup and recovery procedures where not adequately tested prior to implementation. This resulted in a cost center having to re-enter a significant amount of data into the AFMIS.

APPENDIX CC - SAMPLE MANAGEMENT INFORMATION REPORTS

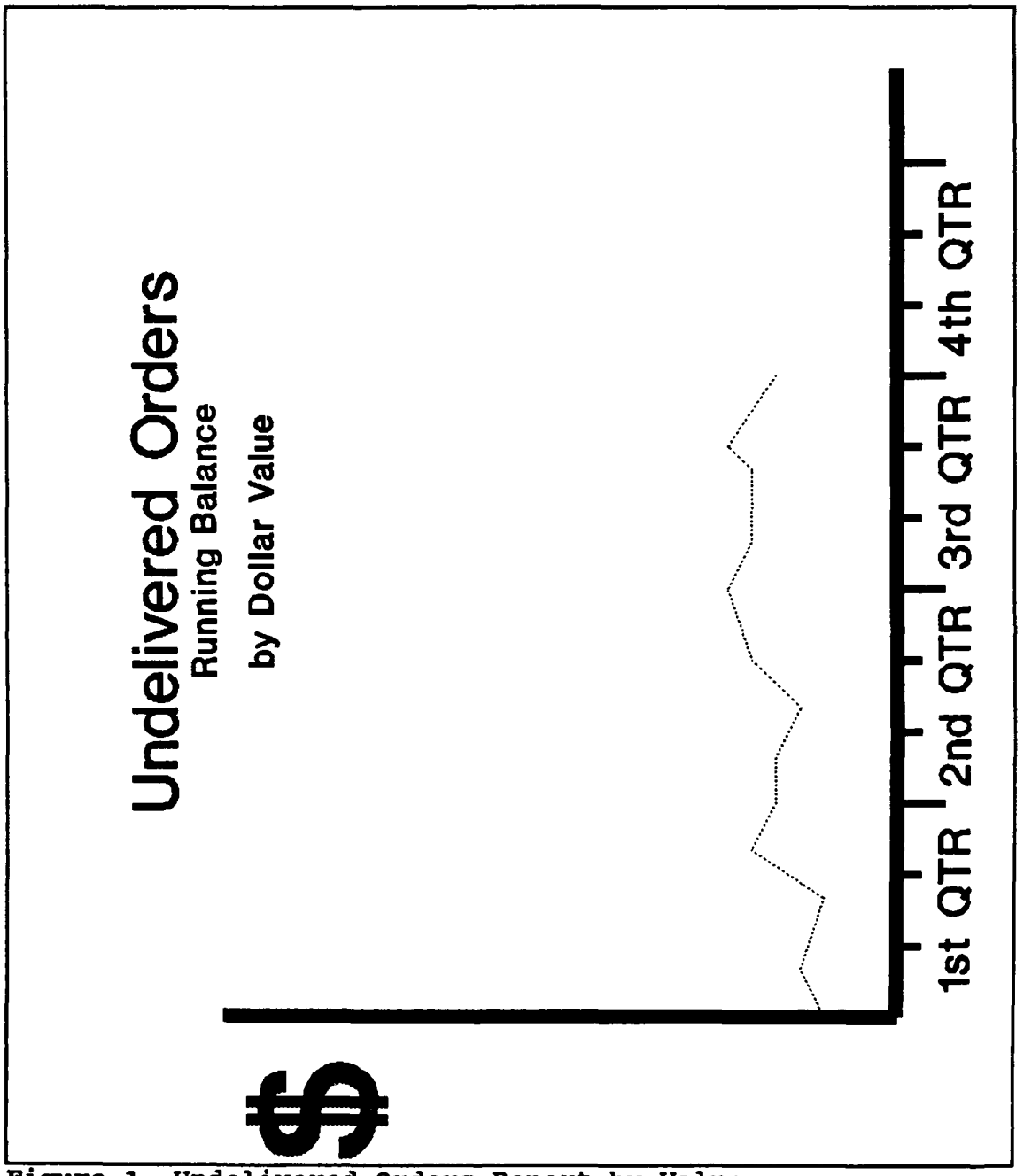

Figure 1 Undelivered Orders Report by Value

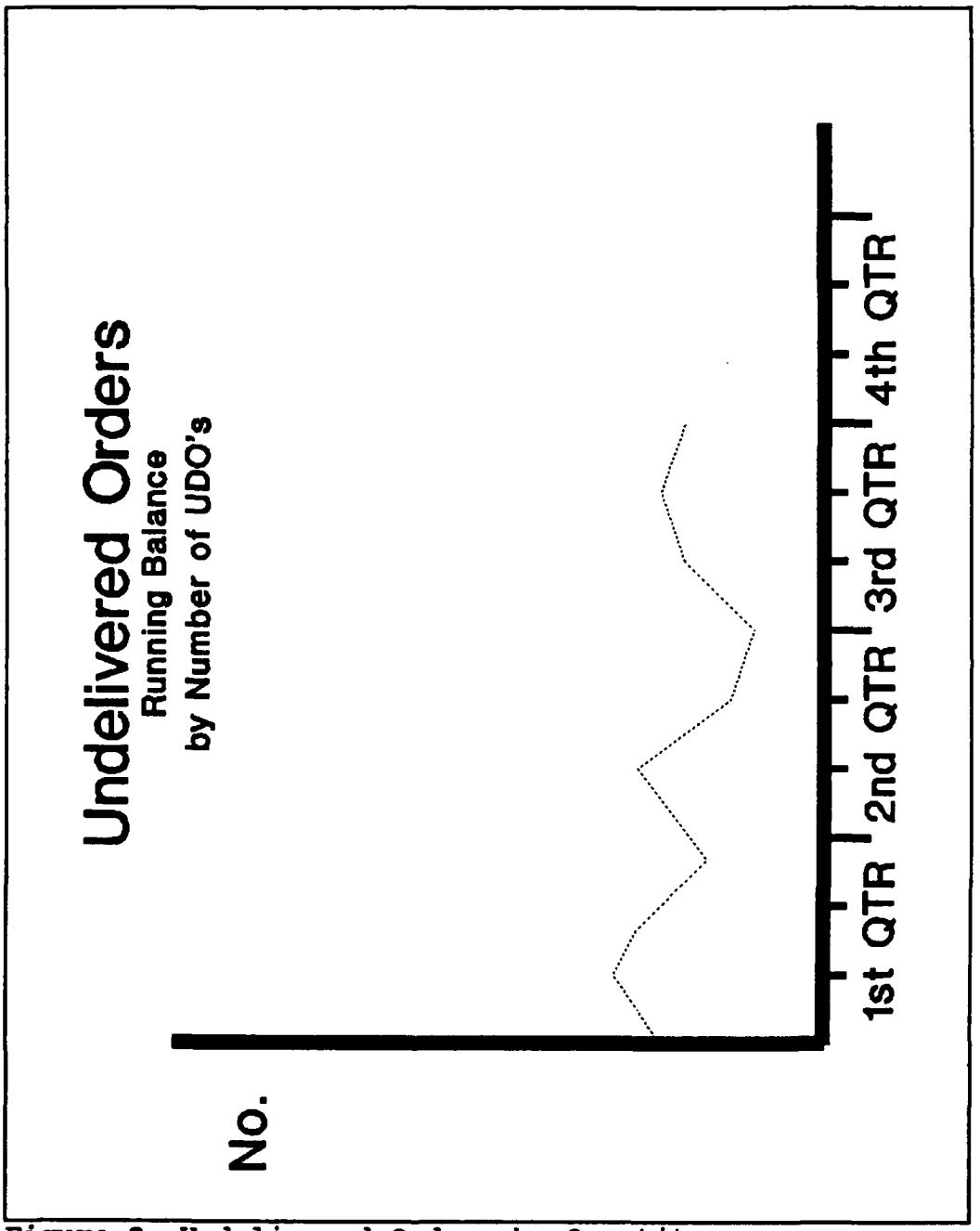

Figure 2 Undelivered Orders by Quantity

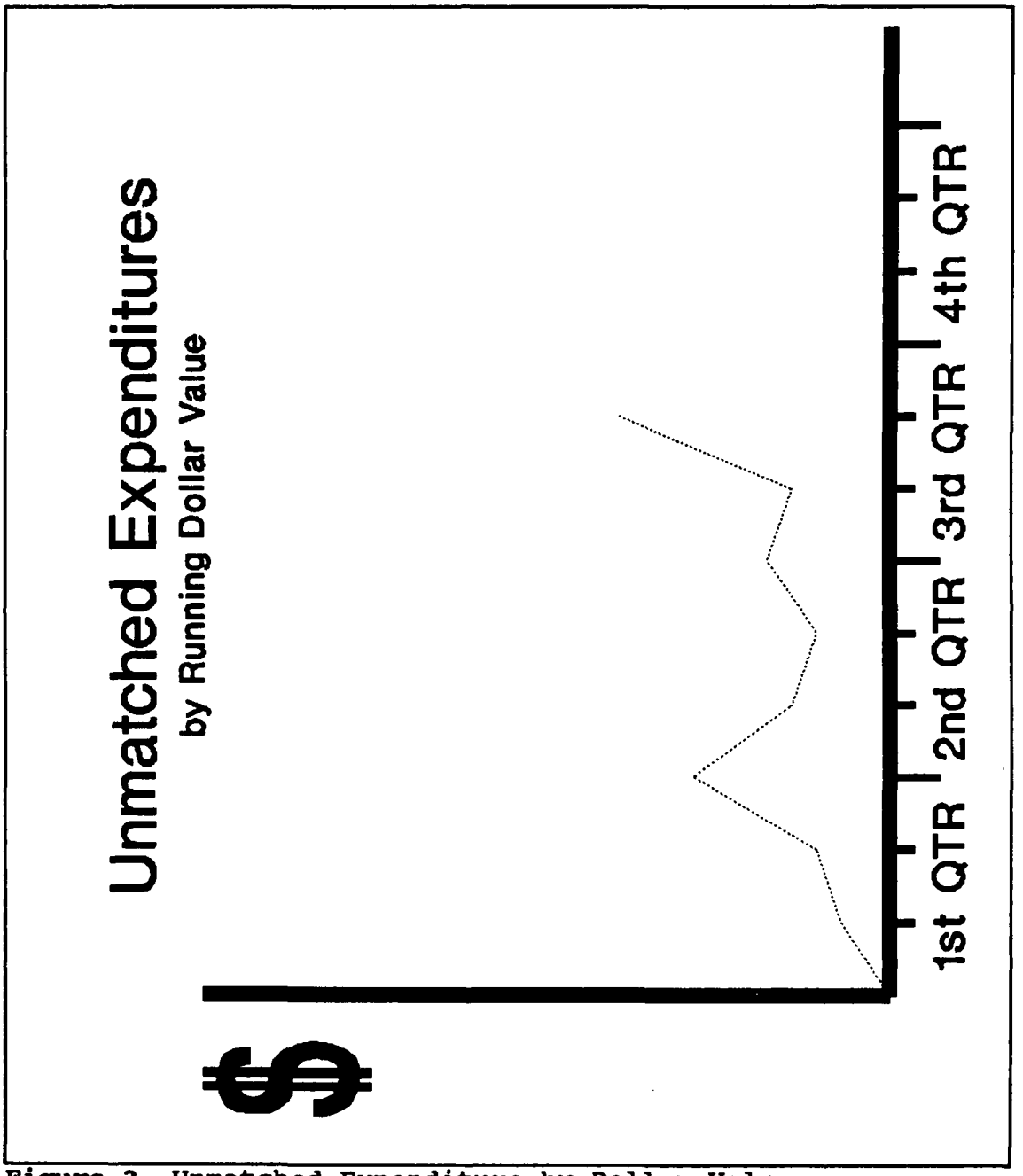

Figure 3 Unmatched Expenditure by Dollar Value

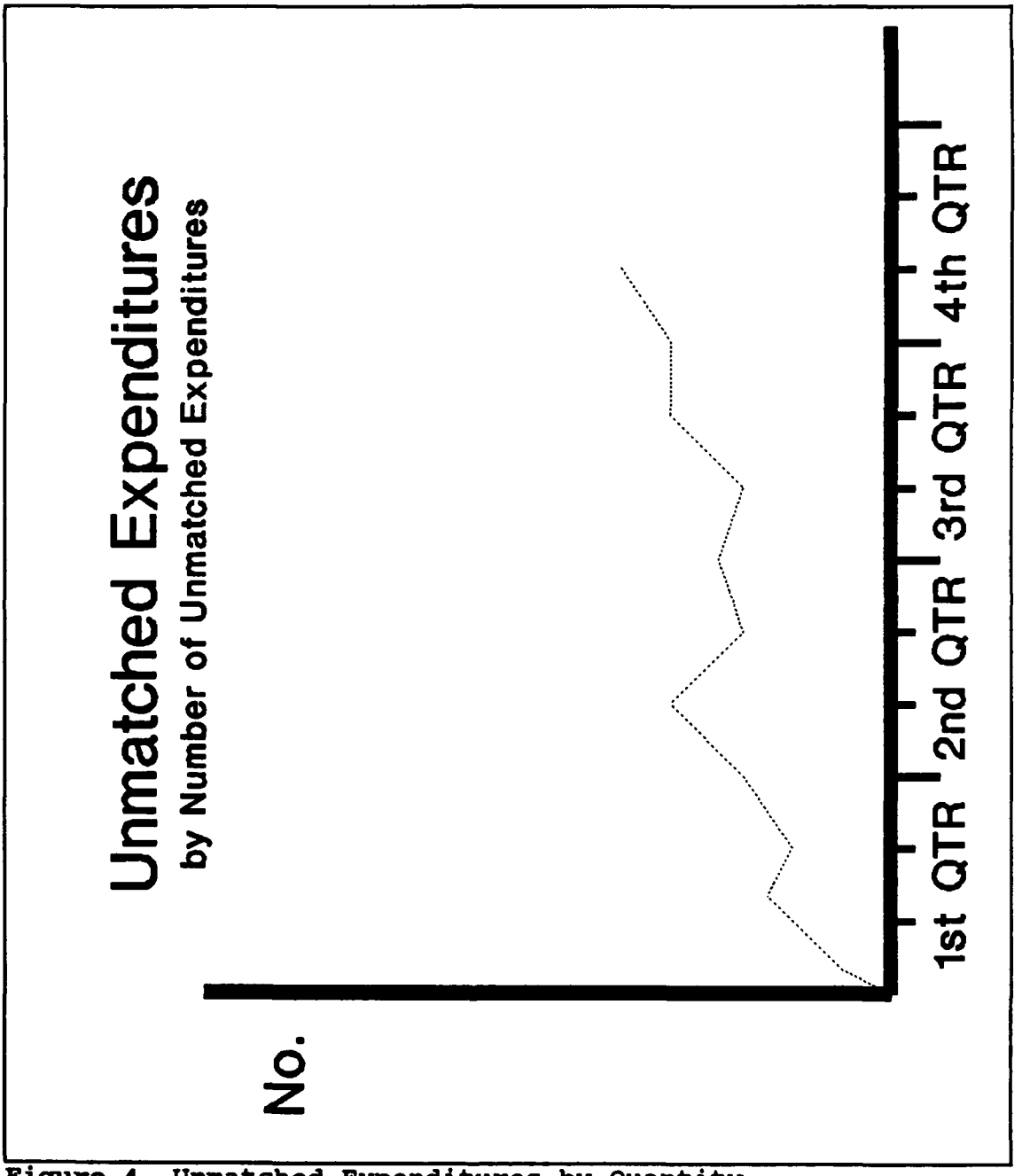

Figure 4 Unmatched Expenditures by Quantity

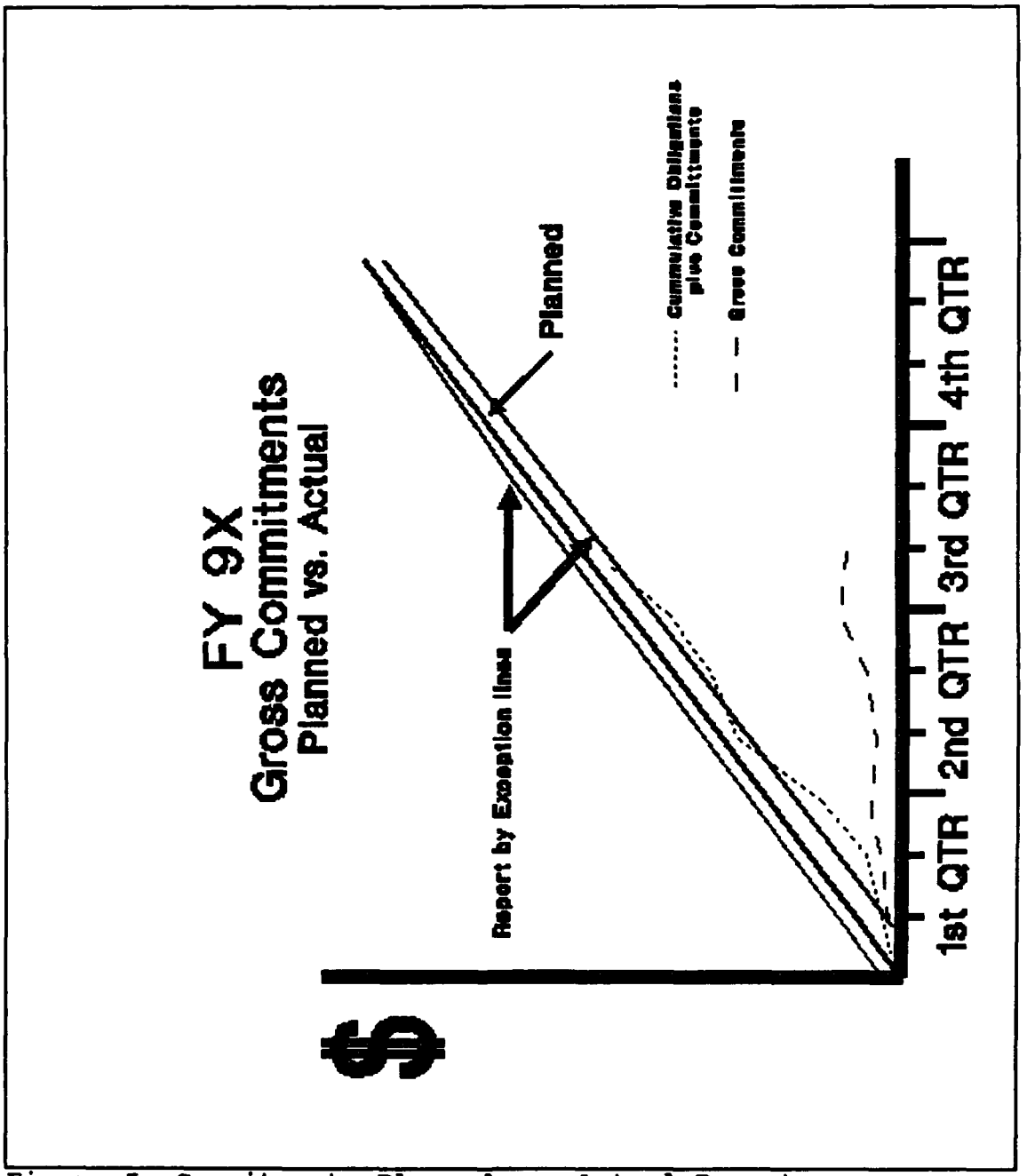

Figure 5 Commitments Planned vs. Actual Report

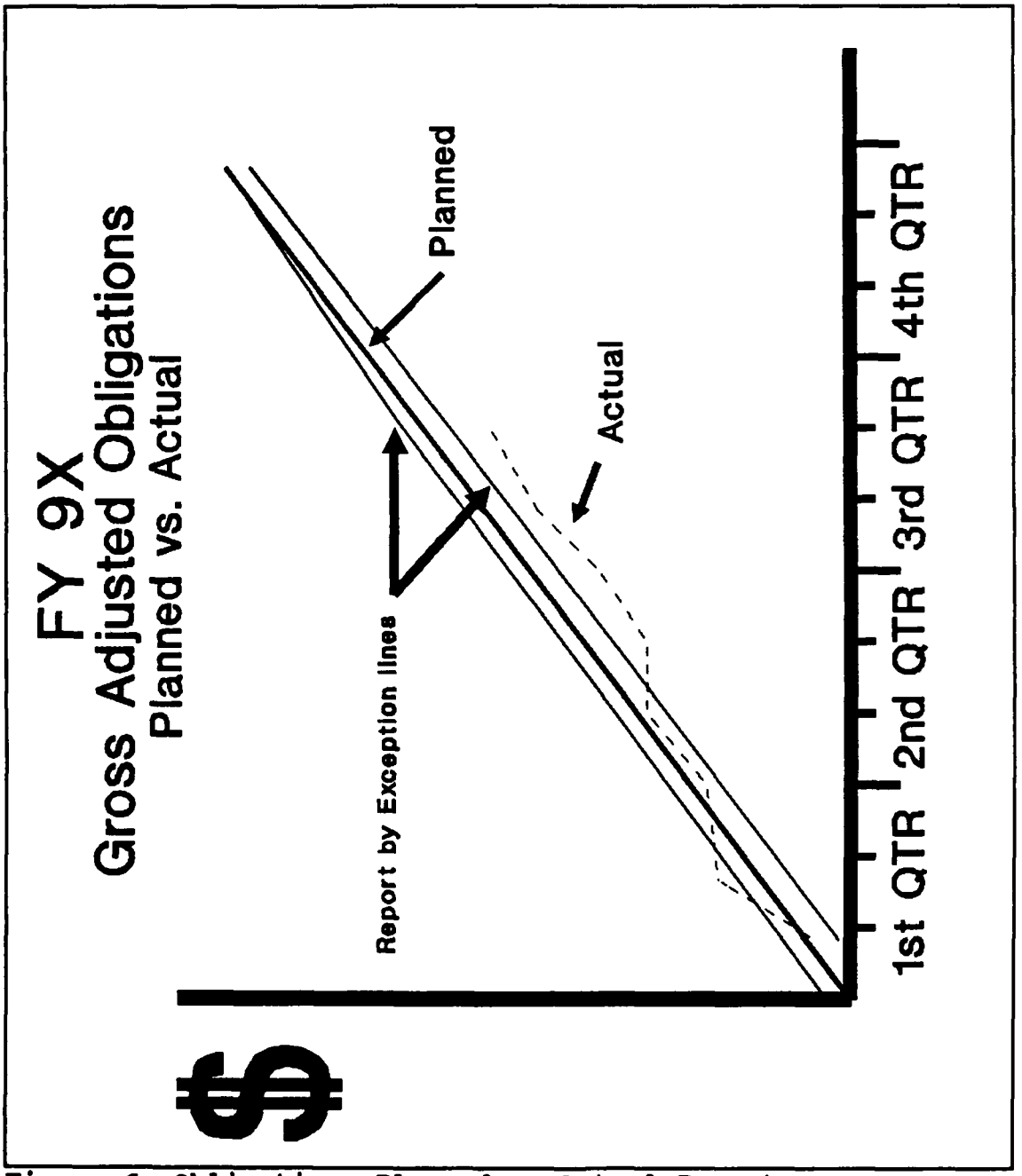

Figure 6 Obligations Planned vs Actual Report

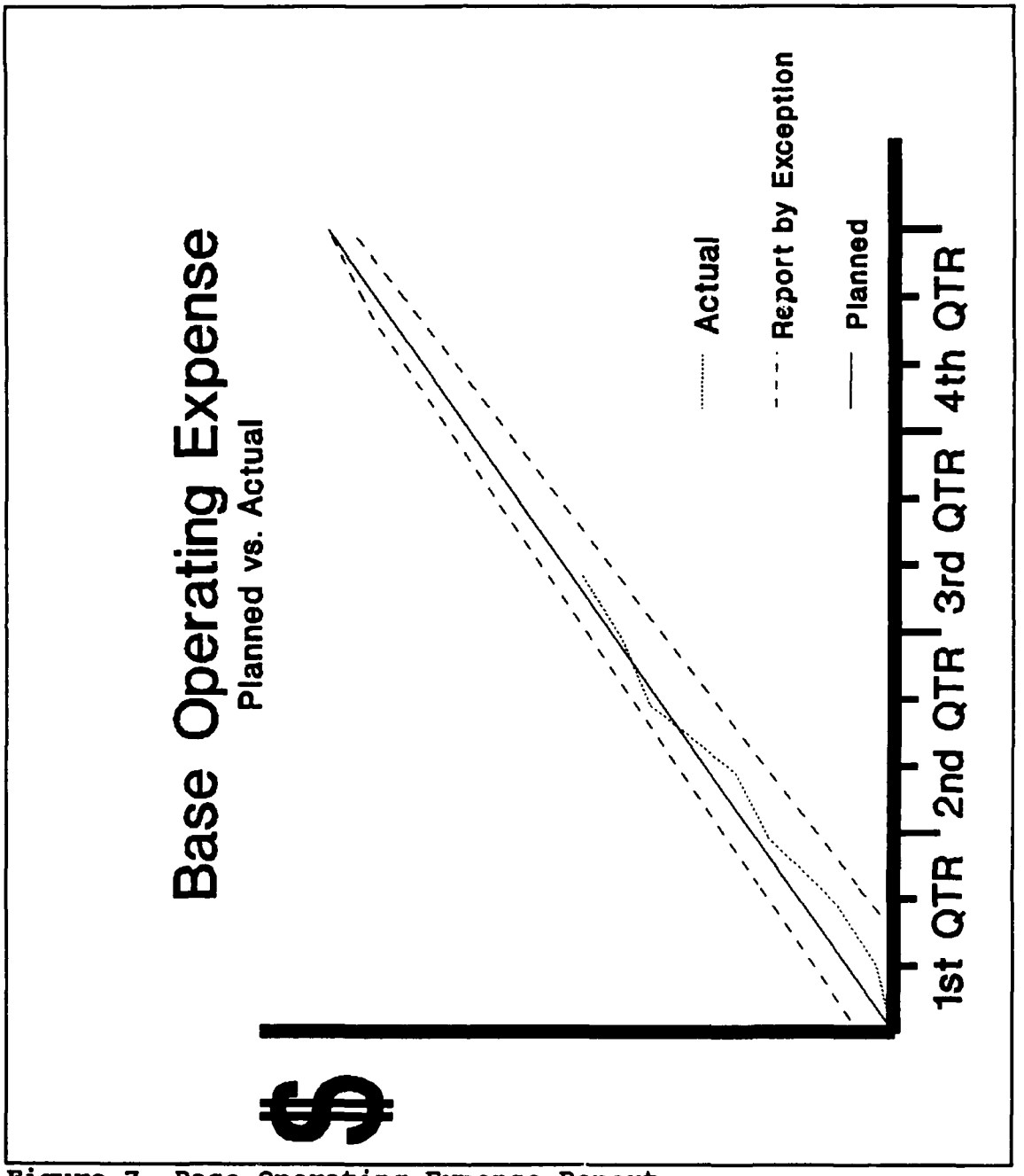

Figure 7 Base Operating Expense Report

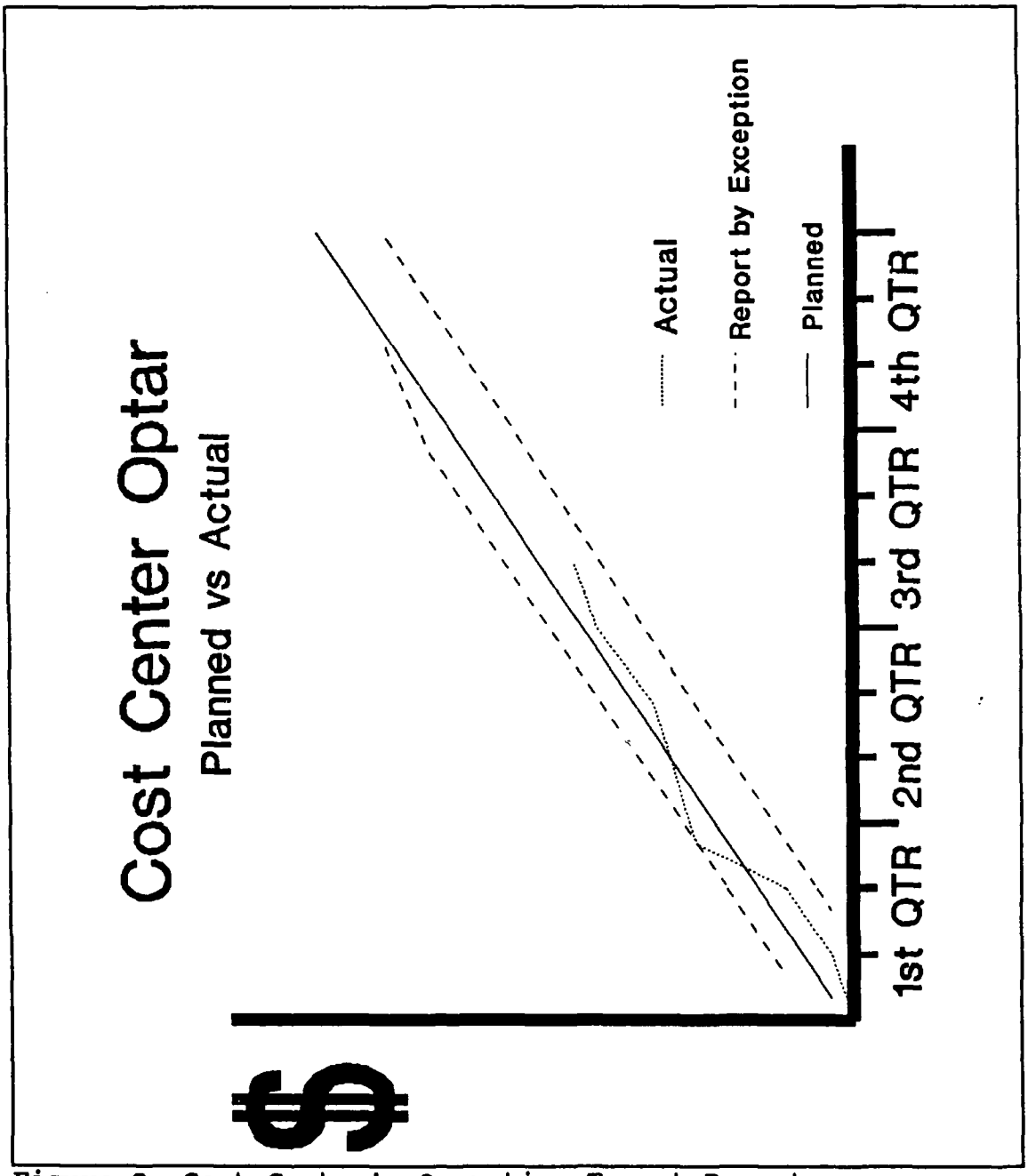

Figure 8 Cost Center's Operating Target Report

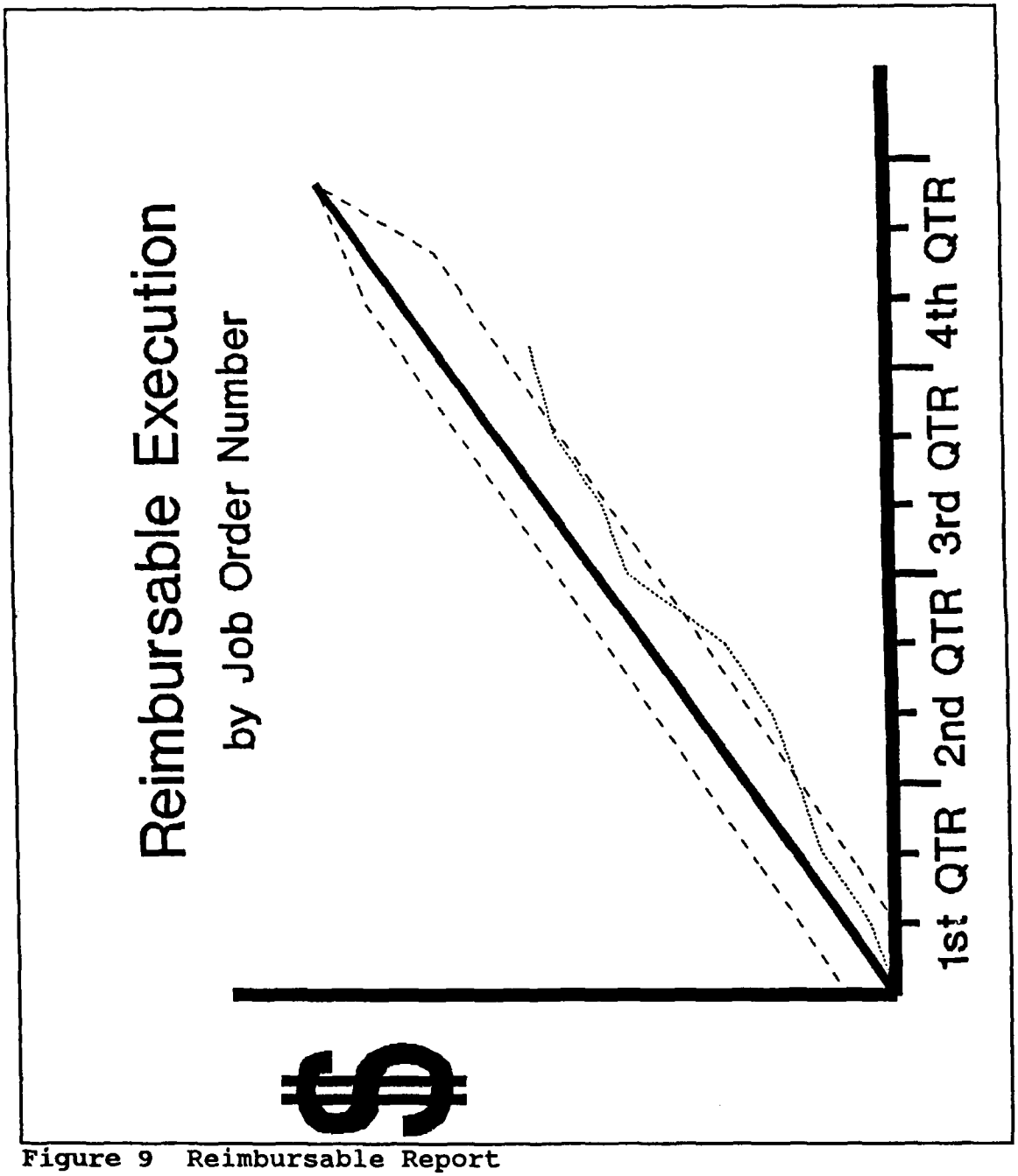

Figure 9 Reimbursable Report

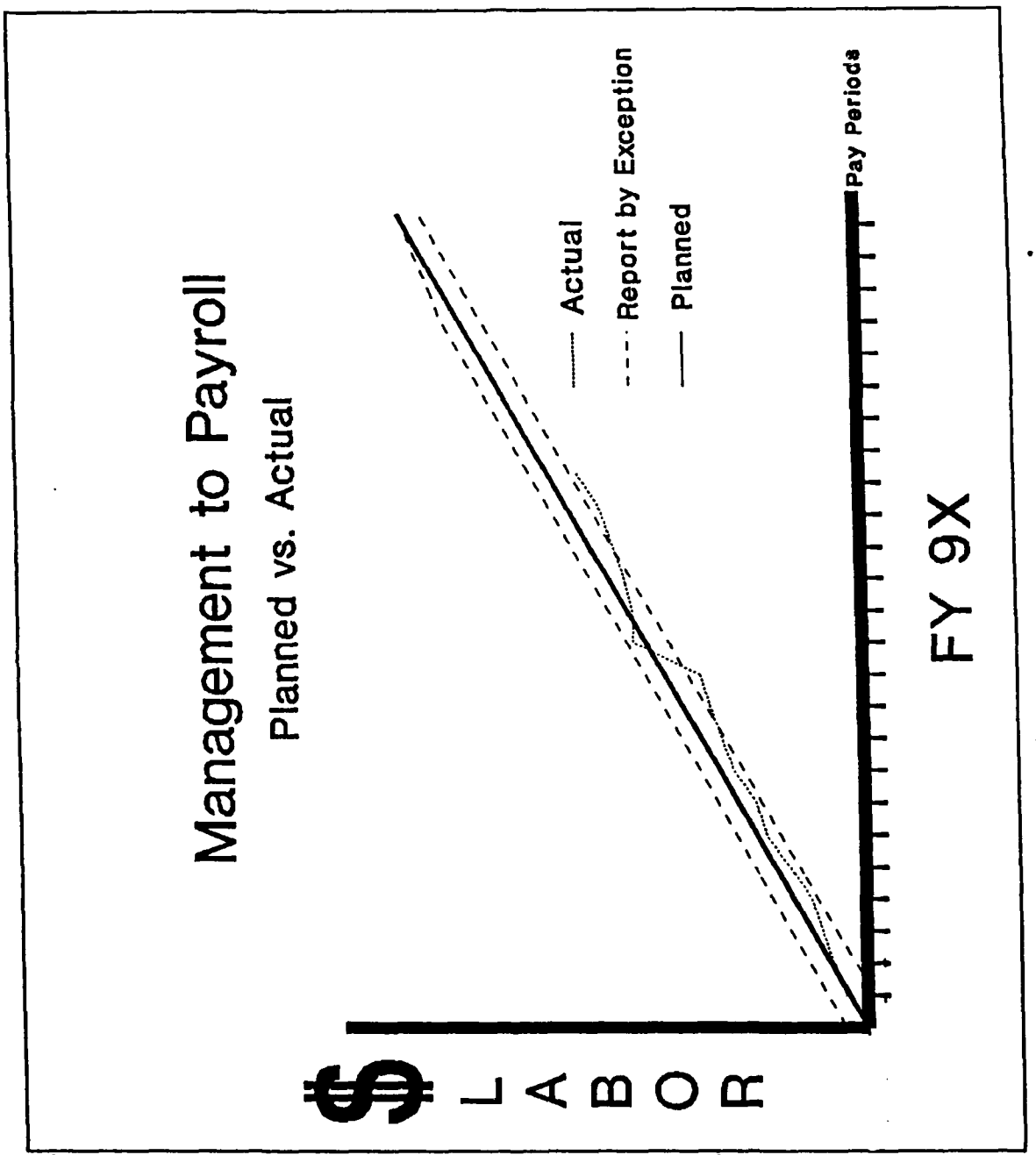

Figure 10 Management to Payroll, Cumulative

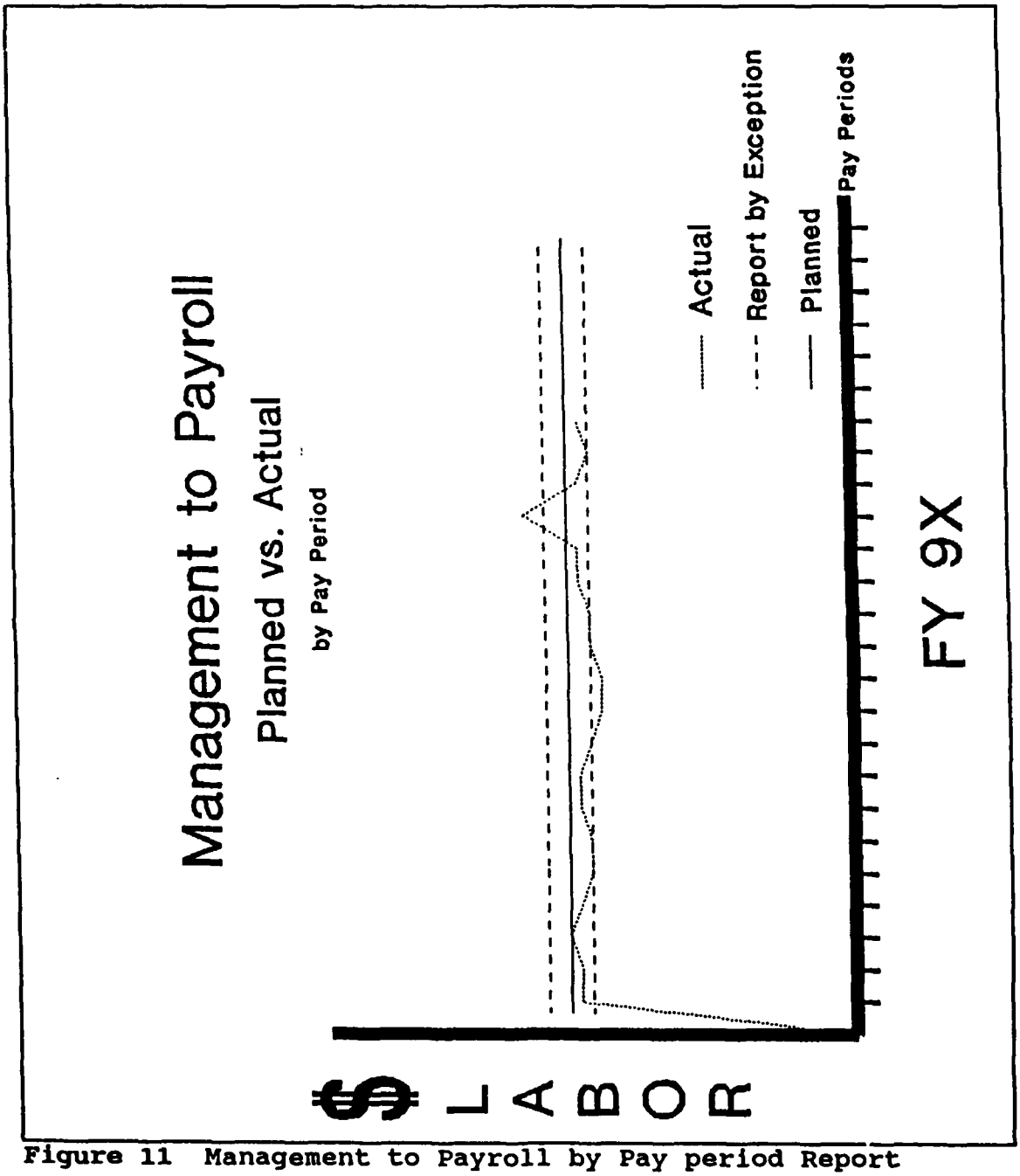

Figure 11 Management to Payroll by Pay period Report

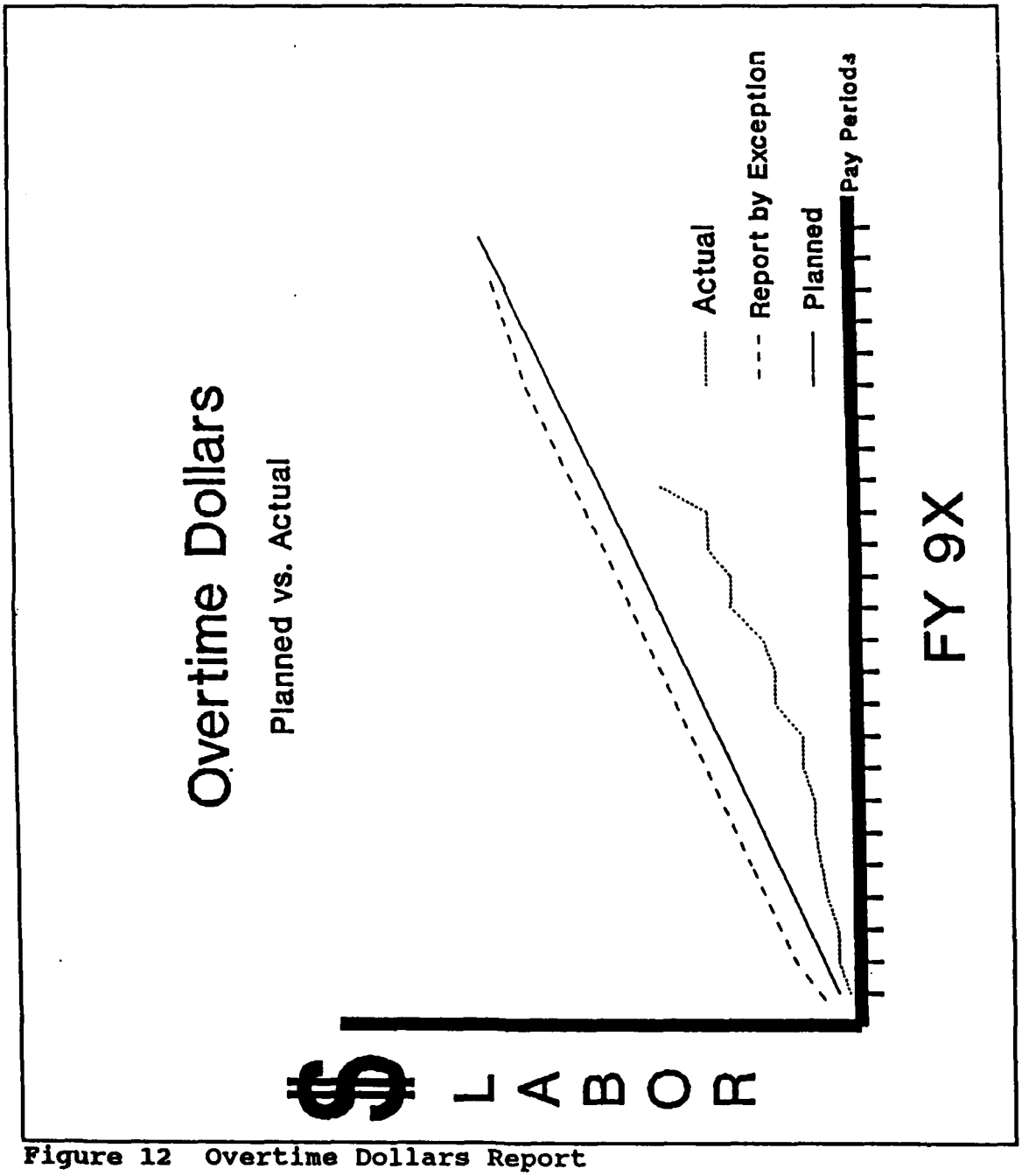

Figure 12 Overtime Dollars Report

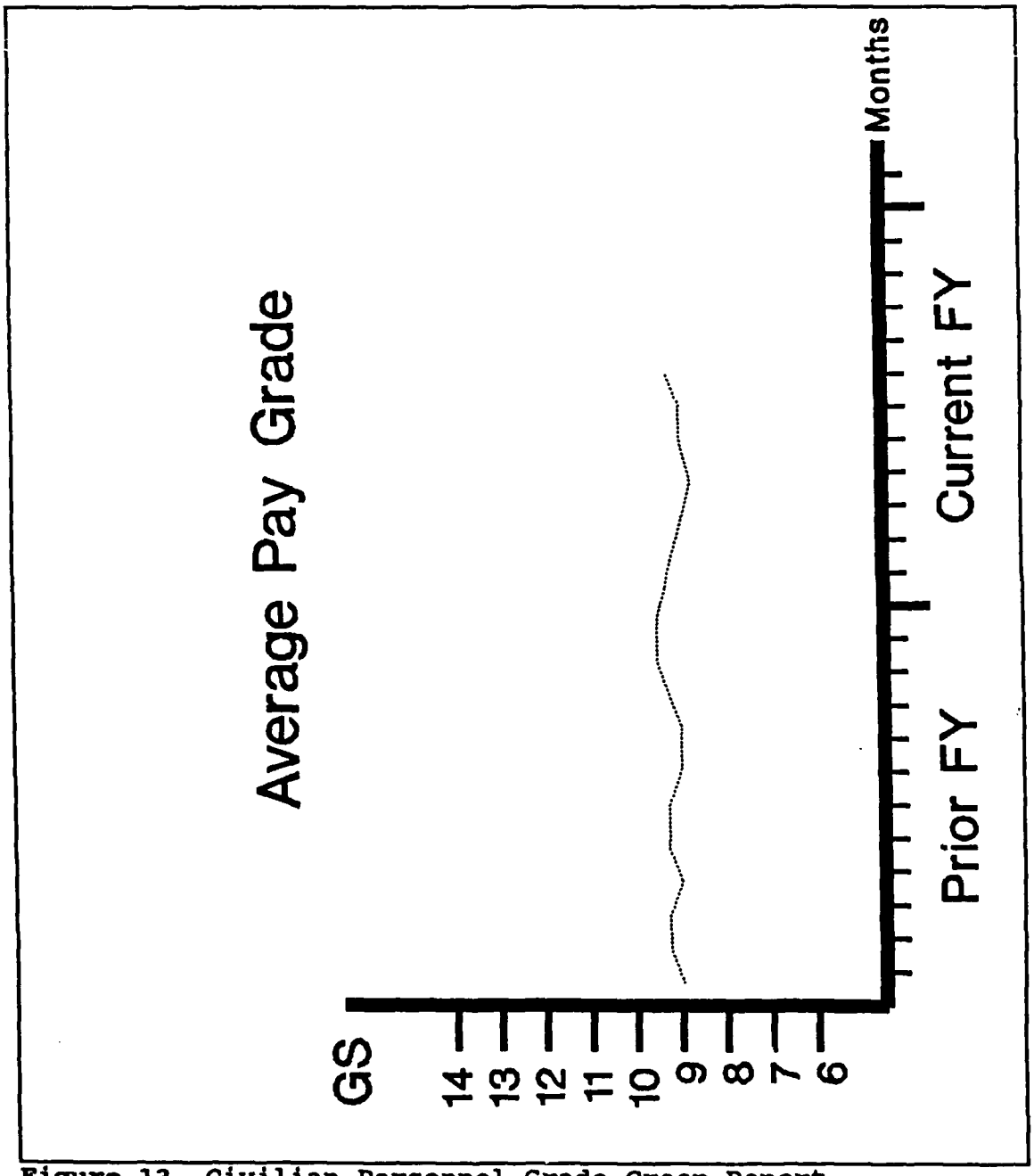

Figure 13 Civilian Personnel Grade Creep Report

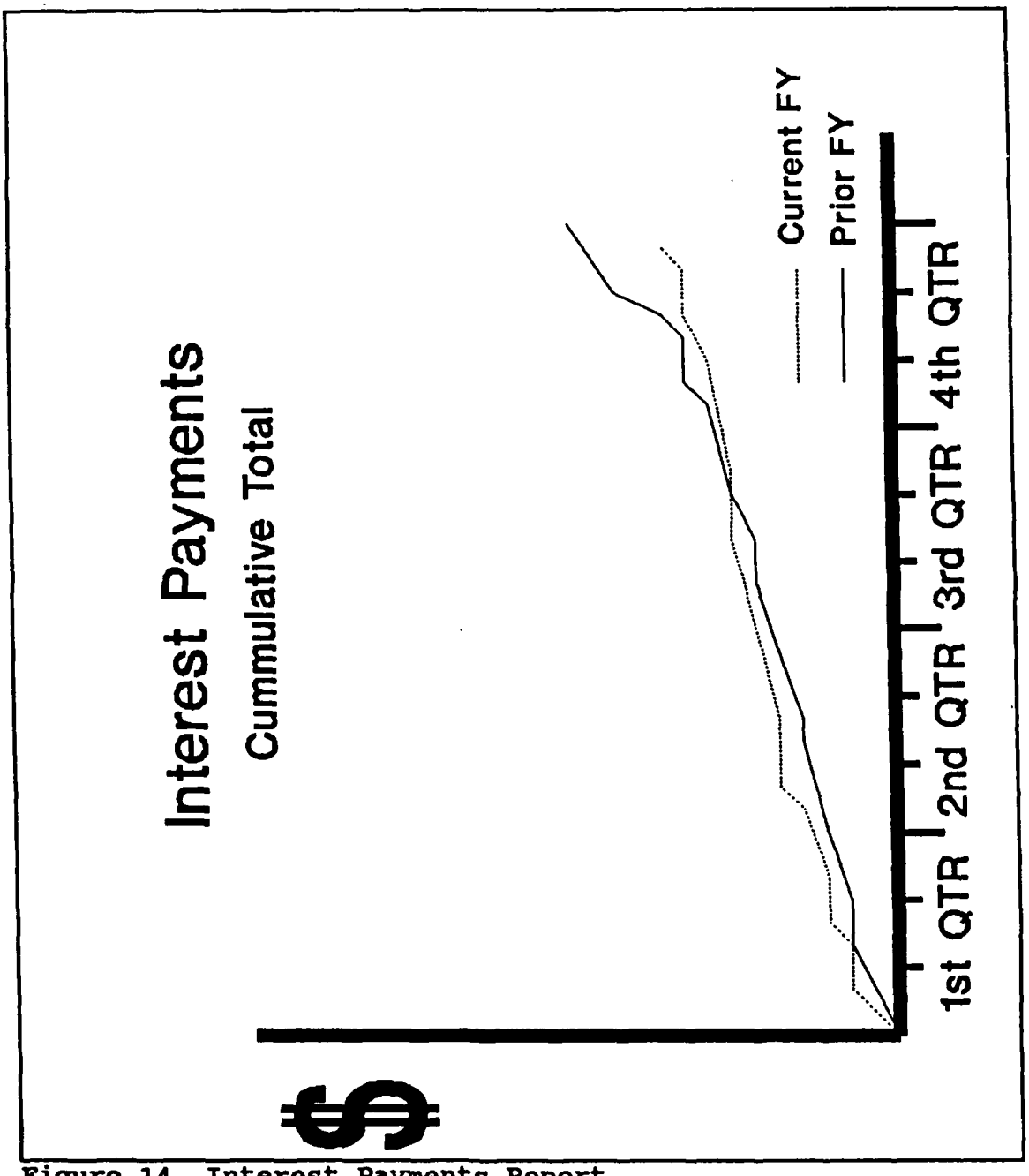

Figure 14 Interest Payments Report

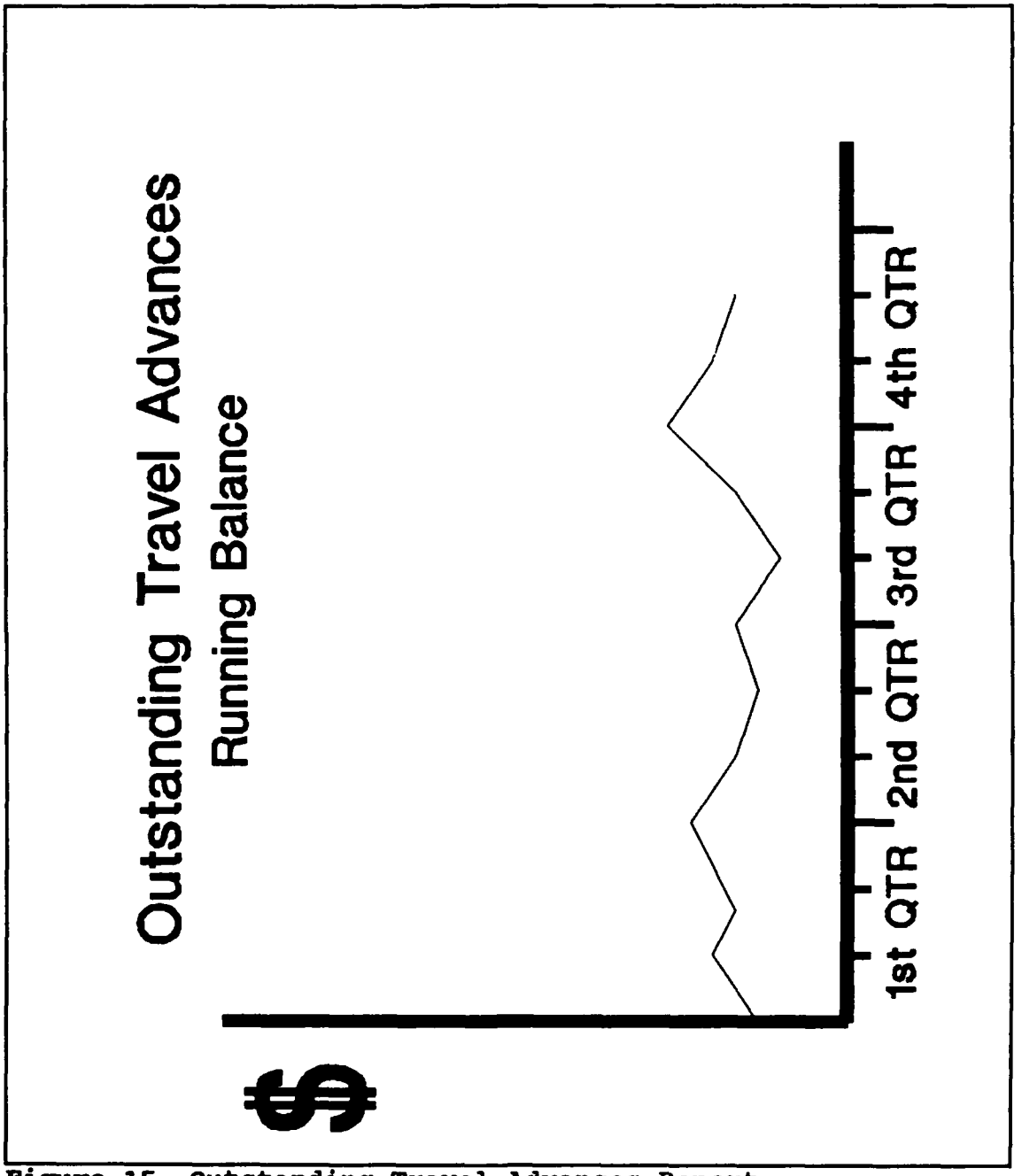

Figure 15 Outstanding Travel Advances Report

APPENDIX DD - COMPUTERS

As micro-computers are readily available in most organizations, the emphasis in this document is on the use of micro-computers, also known as desk-top computers or personal computers (PC's). Even though this paper addresses micro-computers, the theory is the same for all computer systems, the difference will be in the size of the computer, cost of the computer, and the amount of information that can be processed in a given period of time.

A computer is a tool. If understood and used properly, a computer can assist in conducting a multitude of repetitive tasks in a very fast and efficient manner. A computer is an electronic device that follows very explicit instructions.

Since a computer is an electronic piece of hardware, a computer does not have the ability to think or make decisions on its own. A computer can only differentiate the difference between electrical voltage levels in circuits. And based upon these voltage levels, the computer can translate these into understandable instructions. The different voltage levels in the computer represents 1's and 0's. With the proper combination of 1's and 0's, the computer is able to understand and perform a function for the operator of the computer. (The term 'operator' is a general term that identifies the person that is operating the computer. The term 'user' in respect to micro-computers is also the operator.) Each possible 1 or 0 is called a bit. A combination of eight 1's or

0's is called a Byte. A group of 1's and 0's that perform a function within the computer is call a computer instruction. It usually takes more then one byte to make up an instruction. And it takes thousands to millions of instructions to make up a program, depending on the size of the application.

There are several components to a computer system that must interface to provide the service that the users are asking of the computer. The overall picture of these components are shown in Figure # 1. Each component will be described so that the reader will have a general understanding of how a computer works. First the heart of the computer, which is called the Central Processing Unit, will be discussed. This will be followed with a discussion of the other four components.

1. Central Processing Unit (CPU)

The Central Processing Unit (commonly referred to as the CPU) is the heart of the computer. The CPU is the component that evaluates and executes the instructions of a program. The CPU is designed to interpret the series of 1's and 0's and based upon the evaluation, it will perform some action. This action could be one of a thousand different things, such as add a number; subtract a number; request a new instruction; etc.. The key here is that the CPU is where all of the instructions are processed.

All CPU's are not the same. There are several different manufacturers that have designed and marketed their CPU. Since the CPU is the heart of the system, computers are designed around the CPU. This is so that the computer can take full advantage of the capabilities of the of the CPU. Fortunately, in the 80's, the Navy's procurement practices resulted in a standard in micro-computers

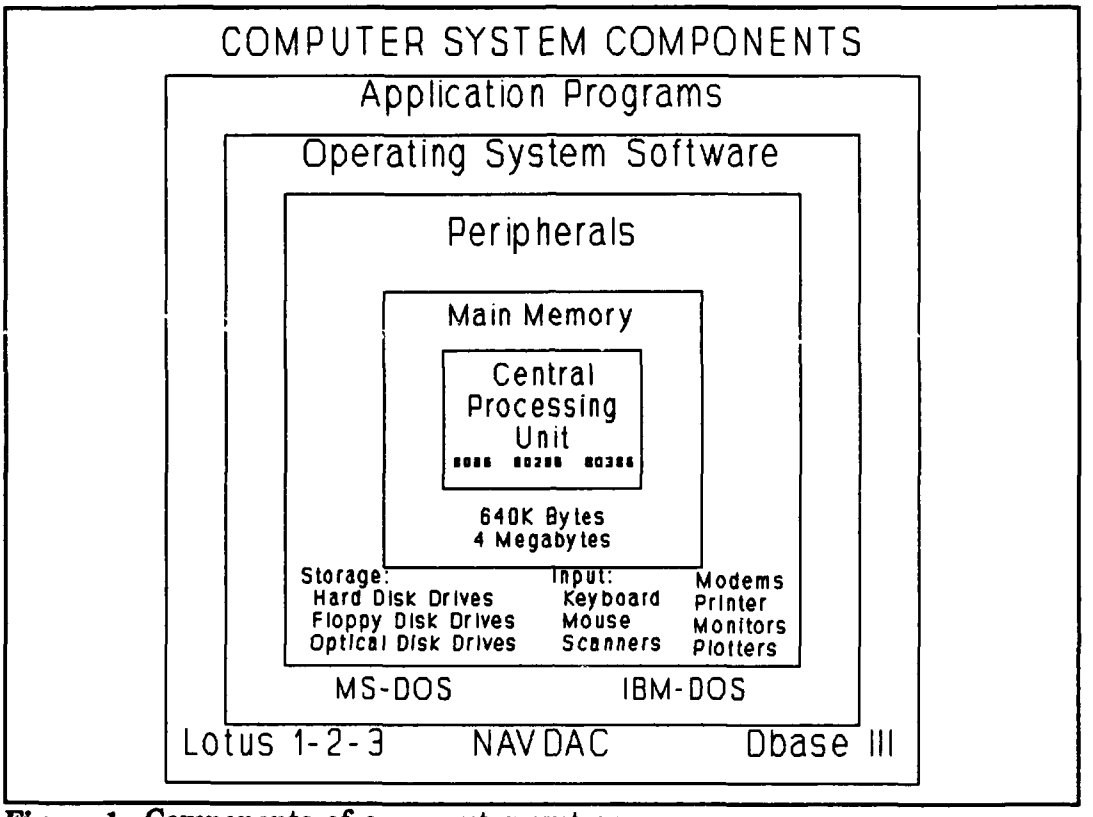

Figure 1 Components of a computer system.

in the Department of the Navy (DoN). The majority of all micro-computers purchased in the Navy were and still are IBM compatible. This means that the micro-computers that are being purchased have a Central Processing Unit that executes IBM compatible software (software that operates under the IBM Disk Operating System (IBM-DOS) or under the Microsoft Disk Operating System (MS-DOS), which are discussed later in this chapter).

Due to the Navy's purchasing practices, there are three CPU's that will be encountered Navy activities. All three are manufactured by the Intel

Corporation. The CPU's are labeled Intel 8086, Intel 80286, and Intel 80386 (Intel is currently developing the Intel 80486, which will not be discussed here).

a. Intel's 8086 CPU (PC, PC/XT)

The processor used in the IBM-PC, in the early 80's, was the Intel 8086. Compared to today's standards, this is considered a slow processor for desk top applications. The IBM-PC (PC, stands for IBM-PC or compatible) was limited in its ability to expand (not because of the CPU but because of the design of the computer around the CPU). As a result, IBM redesigned the PC and came out with the IBM-PC/XT (XT, stands for IBM-PC/XT or compatible). The XT used the same CPU as the PC, but it had the flexibility to add additional peripherals (peripherals are hardware components such as disk drives, modems, mouse, etc., which will be discussed later in this chapter).

b. Intel's 80286 CPU (AT)

In the mid 80's Intel released the 80286 CPU. This processor, along with the improved computer architecture designed around it, was significantly faster then the 8086. This new computer was classified as the IBM-AT (AT, stands for IBM-AT or compatible). There were several hardware innovations during the refinement of the AT, such as high capacity floppy disk drives and access to additional memory (both are discussed later in this chapter).

The majority of software designed for use on the PC and XT can be used on the AT. Recently, software has been developed to exploit the capability of the 80286 processor. Specific applications for the AT will not be usable (will not be compatible) on the PC or XT.

c. *Intel's 80386 CPU (386)*

In the past two years Intel has been promoting a new CPU, the 80386 processor. This processor has improved capabilities over the 80286 processor. The computers that are built around this processor are commonly referred to as 386 machines. 386 computers are faster then AT machines. But the significant change that was introduced in the 386 was "multi-tasking". This is where more then one program can run at the same time. As with the 80286, the 386 is backward compatible, which means that it can execute programs that were designed for the PC, XT, and AT. Programs written explicitly for the 386 will not be useable on the previous computers.

2. Computer Memory

All computers have a set of transistors that are specially designed to store the electric voltages that represent the 1's and 0's for the computer to work from. On a micro-computer, machines have 640K (640,000 bytes) of memory, others with more and others with less. This number represents the number of transistors in the machine to temporarily store the instructions and data that was entered into the machine.

When a program is loaded into a computer, the program is being loaded into memory, call Random Access Memory (RAM). When the operator runs a program (after it has been loaded into the computer) the instructions for the program are coming from the RAM and the data that is being enter is also being stored into the RAM.

The amount of RAM needed depends on the software package that the operator decides to use and the amount of data that will be handled. Once the

operator knows what the application requirements are, the operator should go to the Automated Data Processing Center within their command and ask for their advice.

Note that RAM is temporary. When a machine is turned off, the program and data are lost. When a new application is loaded into the computer, the previous application and data will be removed. Permanent storage techniques are discussed next.

3. Peripherals

Peripheral are hardware components that are attached to the computer to perform some task. Peripherals fall into three categories: storage devices; input devices; and output devices.

a. Storage Devices

A storage device is any mechanism that is attached to a computer that makes it possible to save and reuse programs and data. There are several storage devices on the market. This document will focus on the more common or soon to be common storage devices. All storage devices work on a basic technology of a tape recorder. By using the tape recorder as an example, an illustration as to how computers saves data can be made.

A tape recorder works in the following manner: As the recorder picks up the music that is being played with the microphone, the tape recorder circuits codes the music into electronic signals. These electronic signals are sent to the recording head which in turn generates a magnetic field. This magnetic field, on the recorder head, changes as the signals change in respect to the

music. As the tape passes under the recorders head, the magnetic characteristics of the tape change. This change on the tape captures the magnetic signals.

Due to the properties of the tape, the magnetic signal is retained on the tape for a lengthy period of time. The storage life of the recording is affected by the quality of the tape and how the tape is handled and stored. This is how music is saved and stored for future use.

For retrieving the data on the tape (in this case, the music) the process is reversed. The tape passes under the head of the recorder, and the head now senses the magnetic fields on the tape and translates these signals in signals that the recorder can understand. Now the recorder can recreate the music.

The long term storage devices used in micro-computers are traditionally disk drives. They are called disk drives because of the storage medium used, it is in the shape of a round disk. All disk drives use the same principles of operation. They store data much like the tape recorder but instead of having one continuous tape to record onto, the disks are divided up into tracks, see Figure 2. These tracks work the same as a tape in the tape recorder, the difference is that when more tape is required, the recording head (read/write head) can travel (move) to another track to continue the save or read process.

Over time, the technology used to develop and produce disk drives improved. This technology has introduced various types of disk drives on the market. As a result, a user needs to be aware of the basic differences between them.

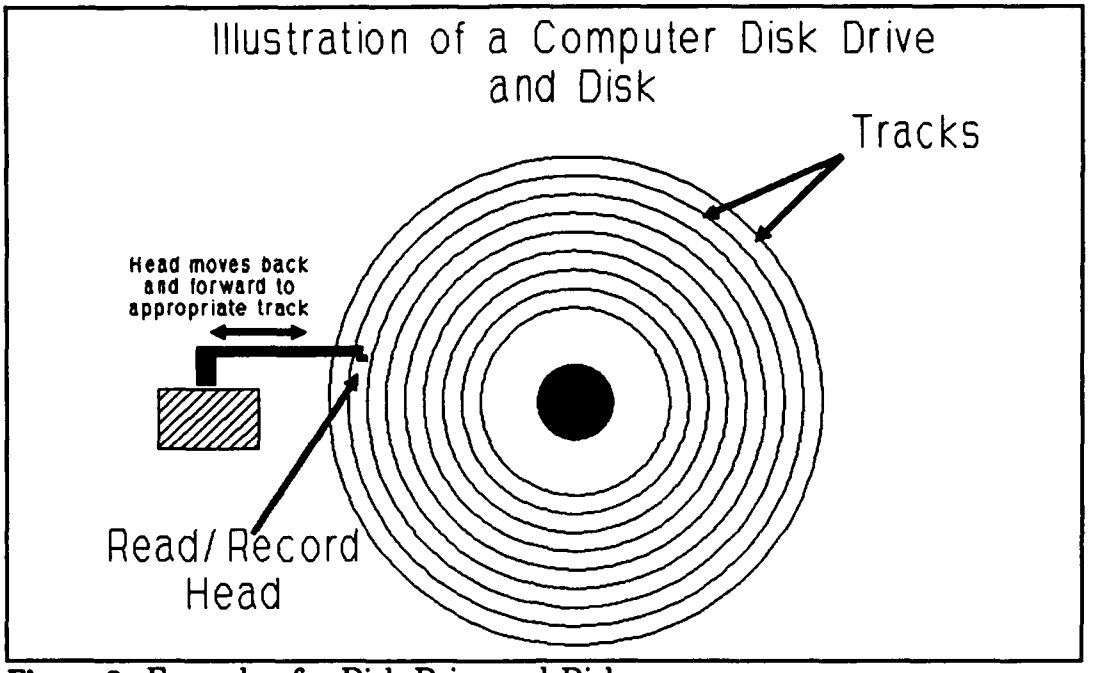

Figure 2 Example of a Disk Drive and Disk

Disk drives fall into three common categories, hard disk drive (also referred to as fixed disk or Winchester drives) which is permanently installed in the computer and can not be easily removed; floppy disk drives, and optical disk drives.

(1) Hard Disk Drives Hard disk drives are traditionally installed internally to the computer. These are usually not removable (there are a limited number of removable hard disk drives on the market but are not frequently used in the DoN). Hard disk drives receive their name from the type of recording medium used in them. Like all other disk drives, hard disk drives use a round disk (or several round disks layered on top of each other). The difference is that the disk is made out of hard metallic material versus a

floppy disk that is made of a flexible recording material. The properties of the hard disk drives make it possible to save far greater quantities of data compared to floppy disk drives. Hard disk drives have a storage capability ranging from 10 million bytes of information up to several hundred million bytes of information (floppy disks have a capacity ranging from 360,000 to 1.4 million bytes).

(2) Floppy Disk Drives Floppy disk drives received this label because of the flexible recording medium used. One of the primary advantages of floppy disk drives is that the recording medium is easily removable. This makes it possible to enter and store data at one micro-computer, save the data to the floppy disk, remove the floppy disk, then place the floppy disk into a different computer for retrieval of information.

In the early 80's the standard for floppy disk drives was a 5 1/4" disk drive that had a storage capacity of 360,000 bytes of information (360K disk drive). By the mid 80's a new 5 1/4" floppy disk drive was developed that had a storage capacity of 1.2 million bytes of information (often referred to as a "high density disk drive"). The technology of the high density disk drive internal components was improved and the high density 5 1/4" disks also had to be of a higher quality. The computer industry made it possible for the new High Density disk drives to be able to retrieve and store data on the 360K disks. But, due to the characteristics of the new high density disks and disk drives, it is not possible to retrieve and store data off a high density disk in a 360K disk drive (unless the high density disk is used as a 360K disk).

A second size floppy disk was developed in the mid 80's, the 3 1/2" floppy disk. This new disk and disk drive has a 720,000 byte storage capability (720K). This floppy disk resulted in a smaller and improved diskette. This diskette, unlike the flexible 5 1/4 " disk, is protected with an improved hard plastic casing. This disk is not compatible with either 5 1/4" disk drives. In the late 80's, the 3 1/2" disk drive was also improved. A high density version of the 3 1/2" disk drive was made available. This high density version has a 1.4 million byte storage capacity. And like the 5 1/4" drives, the high density 3 1/2" disk drives can use the 720K disks but the 720K disk drive can not read the data stored on the high density disks.

(3) Optical Disk Drives The current state of the art in storage medium is in the area of optical disk drives. There are currently two basic types of optical disk drives; the Compact Disk - Read Only Memory (CD-ROM) and the Write Once, Read Many (WORM). These disk drives use laser technology, much like the compact disk players. CD-ROM is more of a data repository. CD-ROM does not have the ability to store information that is in the computer. As the ROM indicates, Read Only Memory, the computer can only access the compact disk and retrieve information from it. The information is traditionally provided for by a commercial or government source that is used by more then one command.

Unlike CD-ROM, the WORM disk drive has the ability to store data that is in the computer much like a hard disk drive. The Worm disk drive has the ability to store approximately 500 million bytes of data.

b. Input Devices

An input device is anything that is attached to the computer that makes it possible to input data or a program into the computer. All input devices are similar in purpose but are quite different in appearance and use. The basic purpose of an input device is to convert data or information from one medium, such as information on a document, into electronic signals that the computer can recognize and use. Then the device sends that signal to the computer for processing. To illustrate this, lets look at the most easily recognized input device, the keyboard, followed by a couple other input devices.

(1) Keyboard A keyboard is an electronic device that sends electronic signals to the computer each time a key is pressed. Each time a key is pressed, the keyboard generates the proper group of 1's and 0's so that the computer recognizes that particular key stroke. There are a multitude of different keyboards that can be used on several different systems. The selection of the keyboard is primarily a matter of preference, as long as the keyboard is compatible with the system that it will be connected to.

(2) Mouse A mouse is an input device that is primarily used as a semi-substitute for the keyboard. The mouse is a hand held device that is attached to the computer via a wire. The mouse is moved around on the desk top which in turns moves a cursor or an arrow on the screen. By pressing a set of buttons on the mouse, the user is able to invoke some predetermined functions that would normally be invoked at the keyboard. The mouse was designed to make it easier for the user to select options or move items around on the screen. The greatest strengths of a mouse is when it is used in a

graphics application. For use in applications that are ledger, data base, or word processing oriented, the use is traditionally limited to menu selections and highlighting text or numbers.

(3) Optical Scanners Optical Scanners, also referred to as Bar Code Readers, are becoming more common in the business community. The device, which may be hand held or stationary, uses a light beam to analyze a series of lines that are specifically printed in a way that the scanner can read the coded item. This device is used in situations where there is a definable set of characters or numbers that need to be entered into the computer many times over. With the use of bar code scanners, this eliminates the possibility of incorrectly entering the code into the computer by mistyping the code from the keyboard. This device is commonly used in the civilian sector and is currently being used in various parts of the Navy today.

(4) Optical Character Reader The Optical Character Reader (OCR) is a device that can recognize characters and numbers on a piece of paper. The device scans the document and by use of both hardware and software, it is able to identify the data on the paper, convert the data to electronic signals, then finally send that signal to the computer. OCR's are costly and if everything is not perfect on the document that is being scanned (in respect to how the scanner is setup) then the system is prone to error.

(5) Modem A user may already have data that is electronically encoded, in that it has already been entered into another computer system. A device called the Modem can bridge the gap between a local computer and a remote computer. A modem can connect the computer with the remote

computer via telephone lines (assuming that the remote computer is equipped with a modem, and can be made compatible with the users modem).

A modem is a hardware device that is connected to the computer (it can be installed inside the computer or be installed external to the computer) and also connected to a telephone line. A modem, via use of software, has the ability to contact a remote computer, request the data that a user wants, and receive that data. The modem, with its software package handles the signal conversion over the telephones in a manner that is transparent to the user. The modem also has the capability of transmitting information to other computers, which makes the modem also an output device.

c. *Output Devices*

An output device is anything that is attached to a computer that makes it possible for the computer to export data/information from the computer. Some easily recognizable output devices are printers, plotters, and monitors. These devices provide visible information to a user in the form of electronic display or paper type presentations.

4. Operating System Software

There are several different components to a computer, but how does the computer control these different pieces of hardware? How does it know when to pull data from a disk drive? How does the computer know where to go cn the disk drive to save or retrieve the data? How does the computer know to look for input from the keyboard, mouse, scanner, or modem? And how does the computer know when to send something to the monitor or printer? The answer to all of these questions is in a software package called the Operating System.

The operating system is specifically designed to handle these type of issues. Since a computer can only perform one task at a time, the operating system makes it possible for the computer to schedule and manage its tasks. The operating system monitors the requests placed upon the computer and handles the details of telling the computer what to do and when to do it.

There are several different operating systems on the market. All of them are designed with special features and capabilities. The two that are widely used in Comptroller department micro-computers are Microsoft's MS-DOS (Microsoft Disk Operating System) and IBM's IBM-DOS, which is the same as MS-DOS except it is marketed by IBM. A third operating system is called OS/2, which stands for Operating System 2. OS/2 is being developed by Microsoft, and is the possible replacement for MS-DOS in the 80386 and newer CPU's.

Operating systems acts as the interface between the computer and application programs. Programs use the capabilities of the operating system to perform the low level tasks of managing the different parts of the computer system. This means that programs are written with a specific operating system in mind. So, if a user attempts to use a program under a different operating system then intended, the results are unpredictable. All software packages clearly specify which operating system it was intended for.

5. Computer Programs and Data

Computers must be told what to do, how to do it, and when to do it. Over the years, the effort that was required for the user/operator to provide the instructions to the computer to perform a task has been greatly reduced. This has been achieved though the development of computer programs (software). A

computer program is a series of instructions encoded in a manner that the computer can understand. Programs are written by trained people called programmers. Programmers create a program with a specific purpose in mind.

With the advent of the micro-computer, thousands of programs have been written for both corporate and private use. Commercially available programs for micro-computers fall into two broad categories. First, programs that are designed for a specific task. The purchaser has a very specific function that needs to be automated. The user has very little flexibility in modifying the program to meet their desires. The following are some examples of this type of programs: word processors; tax preparation packages; inventory control; telecommunication programs for communicating between different computers.

The second category of software help a user develop an application that meets a specific need. Examples are: spreadsheet programs that give the user the ability to automate ledgers, track and manipulate figures, and present figures in a graphical manner; database management programs which gives user the ability to efficiently store and retrieve various records/files within a computer system.

Which type of program to select for use in a Comptroller's department depends on the particular application that is being automated. To select the program to use, the user needs to address both the requirements and capacity of the system to be developed. Once this is known, it is best to consult with the staff in the local computer center for their recommendations.

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